

Keggs'  
Tables and Explanations.  
—  
Fackler.

HG  
8853  
F23  
1870



Presented to  
The Library  
of the  
University of Toronto  
by

CONFEDERATION LIFE ASSOCIATION

Digitized by the Internet Archive  
in 2007 with funding from  
Microsoft Corporation



PROPERTY OF  
CONFEDERATION LIFE ASSOCIATION  
LIBRARY.

AGENTS'

*Mr. W. C. McDonald*  
*with the*  
*Compliment*  
*of the Author*

# MONETARY, LIFE & VALUATION

Released From Library Of  
Confederation Life Association

## TABLES,

WITH

## VALUABLE EXPLANATIONS.

SECOND EDITION, ENLARGED AND REVISED.

BY <sup>David</sup> D. PARKS FACKLER,

<sup>111</sup>  
CONSULTING ACTUARY AND ACCOUNTANT.

---

"KNOWLEDGE ADVANCES."

---

NEW YORK :  
INSURANCE MONITOR OFFICE, 176 BROADWAY.

1870.

Referred From Library Of  
Confederation Life Association

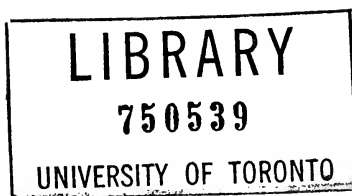
~~8461~~  
FEB 18 1948

Entered according to Act of Congress, in the year of our Lord one thousand eight hundred and seventy, by

C. C. HINE,

In the District Court of the United States for the Southern District of New York.

HG  
8853  
F23  
1870



# CONTENTS.

	PAGE
MONETARY TABLES, - - - - -	5
LIFE TABLES, - - - - -	14
VALUATION TABLES—with Explanations and Article on Sur- render Values, - - - - -	26
NET PREMIUMS AND RESERVES—according to the American Table at $4\frac{1}{2}$ per cent., - - - - -	44
PAID-UP INSURANCE ON LAPSED POLICIES—with application of Mass. Non-forfeiture Law, - - - - -	45
THE CONTRIBUTION PLAN OF DIVIDING SURPLUS, - - - - -	48
REDUCTION OF PREMIUM, - - - - -	51
MISCELLANEA, - - - - -	52
TONTINES, - - - - -	54
DEFINITIONS AND DISTINCTIONS, - - - - -	55
APPENDIX, - - - - -	i
COMMUTATION TABLES, ACTUARIES' TABLES, 4, 5 AND 6 PER CENT., - - - - -	iv
SUBSTITUTES FOR THE APPLICATION OF THE ACCUMULATION FORMULA TO THE ACTUARIES' AND AMERICAN TABLES,	vii
COMPARATIVE SYNOPSIS OF THE PREMIUM AND DIVIDEND SYS- TEMS OF THE VARIOUS COMPANIES, - - - - -	ix

## INTRODUCTORY REMARKS.

---

THE author of this little book has long felt, that something of the sort was needed to explain the ordinary actuarial operations to agents, and relieve actuaries from writing numberless letters; and thought of publishing it himself, until he had more fully considered the trouble that would involve.

The Actuaries' Table, with four per cent. interest, has been mainly followed, because it would serve in connection with the Massachusetts Non-forfeiture Law, and because the rates of most companies are based on four per cent.; the American Table, with four and a half per cent. interest, as adopted by the State of New York, (though believed to be a much better index of the mortality among American insured,) being unsuited in both these respects.

Some people may think, that, as a little knowledge is a dangerous thing, it would be better not to instruct agents on the subjects contained herein—but the wonderful growth of Life Insurance in this country, since it has been explained and popularized by such essays as those of Prof. Wright, seems to prove, that, like all good things, it prospers in Light rather than in Darkness.

But, lest some readers should set up any rules given herein against the usages of some other actuaries, or possibly of the author himself in some cases, it will be well to warn all, that circumstances which they cannot readily appreciate, may alter what they may think the plainest cases.

D. P. F.



# MONETARY TABLES.

---

The interest of \$100.00 for one day at 6 per cent.,

reckoning 360 days to the year, is - - - - \$0.016 6667

The same, reckoning 365 days to the year, is - - - \$0.016 4384

*For the interest at 7 per cent., add  $\frac{1}{6}$ th.*

---

When 6 per cent. annual interest is payable semi-annually (as on U. S. Bonds), and can be re-invested immediately at the same rate, it is equivalent to  $6\frac{3}{10}$  per cent., paid annually.

In the same way, 7 per cent. paid semi-annually is equivalent to  $7\frac{1}{2}$  per cent. annually.

---

The semi-annual premium exactly equivalent to an annual one of \$100, is \$50.83, the thrice-annual is \$34.08, and the quarterly is \$25.63 (interest, 7 per cent., paid annually).

---

To find the rate of interest received on the premiums invested in an Ordinary Endowment policy after it has matured :

Divide the amount of the policy and additions by the annual premium paid, the quotient will show how much has been received for each dollar of annual premium ; then look on pages 8 and 9 on the line for the years equal to the term of the policy, and find the rate of interest which would have given nearly the same result, which is, of course, the rate realized.

AMOUNT OF ONE DOLLAR,  
IN FROM ONE TO FIFTY YEARS.

End of Year.	4 per cent.	4½ per cent.	5 per cent.	6 per cent.
1	1.0400	1.0450	1.0500	1.0600
2	1.0816	1.0920	1.1025	1.1236
3	1.1249	1.1412	1.1576	1.1910
4	1.1699	1.1925	1.2155	1.2625
5	1.2167	1.2462	1.2763	1.3382
6	1.2653	1.3023	1.3401	1.4185
7	1.3159	1.3609	1.4071	1.5036
8	1.3686	1.4221	1.4775	1.5938
9	1.4233	1.4861	1.5513	1.6895
10	1.4802	1.5530	1.6289	1.7908
11	1.5395	1.6229	1.7103	1.8983
12	1.6010	1.6959	1.7959	2.0122
13	1.6651	1.7722	1.8856	2.1329
14	1.7317	1.8519	1.9799	2.2609
15	1.8009	1.9353	2.0789	2.3966
16	1.8730	2.0224	2.1829	2.5404
17	1.9479	2.1134	2.2920	2.6928
18	2.0258	2.2085	2.4066	2.8543
19	2.1068	2.3079	2.5270	3.0256
20	2.1911	2.4117	2.6533	3.2071
21	2.2788	2.5202	2.7860	3.3996
22	2.3699	2.6337	2.9253	3.6035
23	2.4647	2.7522	3.0715	3.8197
24	2.5633	2.8760	3.2251	4.0489
25	2.6658	3.0054	3.3864	4.2919
26	2.7725	3.1407	3.5557	4.5494
27	2.8834	3.2820	3.7335	4.8223
28	2.9987	3.4297	3.9201	5.1117
29	3.1187	3.5840	4.1161	5.4184
30	3.2434	3.7453	4.3219	5.7435
31	3.3731	3.9139	4.5380	6.0881
32	3.5081	4.0900	4.7649	6.4534
33	3.6484	4.2740	5.0032	6.8406
34	3.7943	4.4664	5.2533	7.2510
35	3.9461	4.6673	5.5160	7.6861
36	4.1039	4.8774	5.7918	8.1473
37	4.2681	5.0969	6.0814	8.6361
38	4.4388	5.3262	6.3855	9.1543
39	4.6164	5.5659	6.7048	9.7035
40	4.8010	5.8164	7.0400	10.2857
41	4.9931	6.0781	7.3920	10.9029
42	5.1928	6.3516	7.7616	11.5570
43	5.4005	6.6374	8.1497	12.2505
44	5.6165	6.9361	8.5572	12.9855
45	5.8412	7.2482	8.9850	13.7646
46	6.0748	7.5744	9.4343	14.5905
47	6.3178	7.9153	9.9060	15.4659
48	6.5705	8.2715	10.4013	16.3939
49	6.8333	8.6437	10.9213	17.3775
50	7.1067	9.0326	11.4674	18.4202

## AMOUNT OF ONE DOLLAR

(Continued).

End of Year.	7 per cent.	8 per cent.	9 per cent.	10 per cent.
1	1.0700	1.0800	1.0900	1.1000
2	1.1449	1.1664	1.1881	1.2100
3	1.2250	1.2597	1.2950	1.3310
4	1.3108	1.3605	1.4116	1.4641
5	1.4026	1.4693	1.5386	1.6105
6	1.5007	1.5869	1.6771	1.7716
7	1.6058	1.7138	1.8280	1.9487
8	1.7182	1.8509	1.9926	2.1436
9	1.8385	1.9990	2.1719	2.3579
10	1.9672	2.1589	2.3674	2.5937
11	2.1049	2.3316	2.5804	2.8531
12	2.2522	2.5182	2.8127	3.1384
13	2.4098	2.7196	3.0658	3.4523
14	2.5785	2.9372	3.3417	3.7975
15	2.7590	3.1722	3.6425	4.1772
16	2.9522	3.4259	3.9703	4.5950
17	3.1588	3.7000	4.3276	5.0545
18	3.3799	3.9960	4.7171	5.5599
19	3.6165	4.3157	5.1417	6.1159
20	3.8697	4.6610	5.6044	6.7275
21	4.1406	5.0338	6.1088	7.4002
22	4.4304	5.4365	6.6586	8.1403
23	4.7405	5.8715	7.2579	8.9543
24	5.0724	6.3412	7.9111	9.8497
25	5.4274	6.8485	8.6231	10.8347
26	5.8074	7.3961	9.3992	11.9182
27	6.2139	7.9881	10.2451	13.1100
28	6.6488	8.6271	11.1671	14.4210
29	7.1143	9.3173	12.1722	15.8631
30	7.6123	10.0627	13.2677	17.4494
31	8.1451	10.8677	14.4618	19.1943
32	8.7153	11.7371	15.7633	21.1138
33	9.3253	12.6760	17.1820	23.2252
34	9.9781	13.6901	18.7284	25.5477
35	10.6763	14.7853	20.4140	28.1024
36	11.4239	15.9682	22.2512	30.9127
37	12.2236	17.2456	24.2538	34.0039
38	13.0793	18.6253	26.4367	37.4043
39	13.9948	20.1153	28.8160	41.1448
40	14.9745	21.7245	31.4094	45.2593
41	16.0227	23.4625	34.2363	49.7852
42	17.1443	25.3395	37.3175	54.7637
43	18.3444	27.3666	40.6761	60.2401
44	19.6285	29.5560	44.3370	66.2641
45	21.0025	31.9204	48.3273	72.8905
46	22.4726	34.4741	52.6767	80.1795
47	24.0457	37.2320	57.4176	88.1975
48	25.7289	40.2106	62.5852	97.0172
49	27.5299	43.4274	68.2179	106.7190
50	29.4570	46.9016	74.3575	117.3969

AMOUNT OF ONE DOLLAR *PER ANNUM*  
IN FROM ONE TO FIFTY YEARS.

End of Year.	4 per cent.	4½ per cent.	5 per cent.	6 per cent.
1	1.0400	1.0450	1.0500	1.0600
2	2.1216	2.1370	2.1525	2.1836
3	3.2465	3.2782	3.3101	3.3746
4	4.4163	4.4707	4.5256	4.6371
5	5.6330	5.7169	5.8019	5.9753
6	6.8983	7.0192	7.1420	7.3938
7	8.2142	8.3800	8.5491	8.8975
8	9.5828	9.8021	10.0266	10.4913
9	11.0061	11.2882	11.5779	12.1808
10	12.4864	12.8412	13.2068	13.9716
11	14.0258	14.4640	14.9171	15.8699
12	15.6268	16.1599	16.7130	17.8821
13	17.2919	17.9321	18.5986	20.0151
14	19.0236	19.7841	20.5786	22.2760
15	20.8245	21.7193	22.6575	24.6725
16	22.6975	23.7417	24.8404	27.2129
17	24.6454	25.8551	27.1324	29.9057
18	26.6712	28.0636	29.5390	32.7600
19	28.7781	30.3714	32.0660	35.7856
20	30.9692	32.7831	34.7193	38.9927
21	33.2480	35.3034	37.5052	42.3923
22	35.6179	37.9370	40.4305	45.9958
23	38.0826	40.6892	43.5020	49.8156
24	40.6459	43.5652	46.7271	53.8645
25	43.3117	46.5706	50.1135	58.1564
26	46.0842	49.7113	53.6691	62.7058
27	48.9676	52.9933	57.4026	67.5281
28	51.9663	56.4230	61.3227	72.6398
29	55.0849	60.0071	65.4388	78.0582
30	58.3283	63.7524	69.7608	83.8017
31	61.7015	67.6662	74.2988	89.8898
32	65.2095	71.7562	79.0638	96.3432
33	68.8579	76.0303	84.0670	103.1838
34	72.6522	80.4966	89.3203	110.4348
35	76.5983	85.1640	94.8363	118.1209
36	80.7022	90.0413	100.6281	126.2681
37	84.9703	95.1382	106.7095	134.9042
38	89.4092	100.4644	113.0950	144.0585
39	94.0255	106.0303	119.7998	153.7620
40	98.8265	111.8467	126.8398	164.0477
41	103.8196	117.9248	134.2318	174.9505
42	109.0124	124.2764	141.9933	186.5076
43	114.4129	130.9138	150.1430	198.7580
44	120.0294	137.8500	158.7002	211.7435
45	125.8706	145.0982	167.6852	225.5081
46	131.9454	152.6726	177.1194	240.0986
47	138.2632	160.5879	187.0254	255.5645
48	144.8337	168.8594	197.4267	271.9584
49	151.6671	177.5030	208.3480	289.3359
50	158.7738	186.5357	219.8154	307.7561

N. B.—In these tables the Dollar is supposed to be received at the beginning of each year instead of the end, as in old fashioned tables.

AMOUNT OF ONE DOLLAR *PER ANNUM*

(Continued.)

End of Year.	7 per cent.	8 per cent.	9 per cent.	10 per cent.
1	1.0700	1.0800	1.0900	1.1000
2	2.2149	2.2464	2.2781	2.3160
3	3.4399	3.5061	3.5731	3.6410
4	4.7507	4.8666	4.9847	5.1051
5	6.1533	6.3359	6.5233	6.7156
6	7.6540	7.9228	8.2004	8.4872
7	9.2598	9.6366	10.0285	10.4359
8	10.9780	11.4876	12.0210	12.5795
9	12.8164	13.4866	14.1929	14.9374
10	14.7836	15.6455	16.5603	17.5312
11	16.8885	17.9771	19.1407	20.3843
12	19.1406	20.4953	21.9534	23.5227
13	21.5505	23.2149	25.0192	26.9750
14	24.1290	26.1521	28.3609	30.7725
15	26.8881	29.3243	32.0034	34.9497
16	29.8402	32.7502	35.9737	39.5447
17	32.9990	36.4502	40.3013	44.5992
18	36.3790	40.4463	45.0185	50.1591
19	39.9955	44.7620	50.1601	56.2750
20	43.8652	49.4229	55.7645	63.0025
21	48.0057	54.4568	61.8733	70.4027
22	52.4361	59.8933	68.5319	78.5430
23	57.1767	65.7648	75.7898	87.4973
24	62.2490	72.1059	83.7009	97.3471
25	67.6765	78.9544	92.3240	108.1818
26	73.4838	86.3508	101.7231	120.0999
27	79.6977	94.3388	111.9682	133.2099
28	86.3465	102.9659	123.1354	147.6309
29	93.4608	112.2832	135.3075	163.4940
30	101.0730	122.3459	148.5752	180.9434
31	109.2182	133.2135	163.0370	200.1378
32	117.9334	144.9506	178.8003	221.2515
33	127.2588	157.6267	195.9823	244.4767
34	137.2369	171.3168	214.7108	270.0244
35	147.9135	186.1021	235.1247	298.1268
36	159.3374	202.0703	257.3759	329.0395
37	171.5610	219.3159	281.6298	363.0434
38	184.6403	237.9412	308.0665	400.4478
39	198.6351	258.0565	336.8824	441.5926
40	213.6096	279.7810	368.2919	486.8518
41	229.6322	303.2435	402.5281	536.6370
42	246.7765	328.5830	439.8457	591.4007
43	265.1209	355.9496	480.5218	651.6408
44	284.7493	385.5056	524.8587	717.9048
45	305.7518	417.4261	573.1860	790.7953
46	328.2244	451.9002	625.8628	870.9749
47	352.2701	489.1322	683.2804	959.1723
48	377.9990	529.3427	745.8656	1056.1896
49	405.5289	572.7702	814.0836	1162.9085
50	434.9860	619.6718	888.4411	1280.2994

## PRESENT VALUE OF ONE DOLLAR

DUE IN FROM ONE TO FIFTY YEARS HENCE.

End of Year	4 per cent.	4½ per cent.	5 per cent.	6 per cent.
1	.961538	.956938	.952381	.943396
2	.924556	.915730	.907029	.889996
3	.888996	.876297	.863838	.839619
4	.854804	.838561	.822702	.792094
5	.821927	.802451	.783526	.747258
6	.790315	.767896	.746215	.704961
7	.759918	.734828	.710681	.665057
8	.730690	.703185	.676839	.627412
9	.702587	.672904	.644609	.591898
10	.675564	.643928	.613913	.558395
11	.649581	.616199	.584679	.526788
12	.624597	.589664	.556837	.496969
13	.600574	.564272	.530321	.468839
14	.577475	.539973	.505068	.442301
15	.555265	.516720	.481017	.417265
16	.533908	.494469	.458112	.393646
17	.513373	.473176	.436297	.371364
18	.493628	.452800	.415521	.350344
19	.474642	.433302	.395734	.330513
20	.456387	.414643	.376889	.311805
21	.438834	.396787	.358942	.294155
22	.421955	.379701	.341850	.277505
23	.405726	.363350	.325571	.261797
24	.390121	.347703	.310068	.246979
25	.375117	.332731	.295303	.232999
26	.360689	.318402	.281241	.219810
27	.346817	.304691	.267848	.207368
28	.333477	.291571	.255094	.195630
29	.320651	.279015	.242946	.184557
30	.308319	.267000	.231377	.174110
31	.296460	.255502	.220359	.164255
32	.285058	.244500	.209866	.154957
33	.274094	.233971	.199873	.146186
34	.263552	.223896	.190355	.137912
35	.253415	.214254	.181290	.130105
36	.243669	.205028	.172657	.122741
37	.234297	.196199	.164436	.115793
38	.225285	.187750	.156605	.109239
39	.216621	.179665	.149148	.103056
40	.208289	.171929	.142046	.097222
41	.200278	.164525	.135282	.091719
42	.192575	.157440	.128840	.086527
43	.185168	.150661	.122704	.081630
44	.178046	.144173	.116861	.077009
45	.171198	.137964	.111297	.072650
46	.164614	.132023	.105997	.068538
47	.158283	.126338	.100949	.064658
48	.152195	.120898	.096142	.060998
49	.146341	.115692	.091564	.057546
50	.140713	.110710	.087204	.054288

## PRESENT VALUE OF ONE DOLLAR

(Continued.)

End of Year.	7 per cent.	8 per cent.	9 per cent.	10 per cent
1	.934579	.925926	.917431	.909091
2	.873439	.857339	.841680	.826446
3	.816298	.793832	.772183	.751315
4	.762895	.735030	.708425	.683013
5	.712986	.680583	.649931	.620921
6	.666342	.630170	.596267	.564474
7	.622750	.583490	.547034	.513158
8	.582009	.540269	.501866	.466507
9	.543934	.500249	.460428	.424098
10	.508349	.463193	.422411	.385543
11	.475093	.428883	.387533	.350494
12	.444012	.397114	.355535	.318631
13	.414964	.367698	.326179	.289664
14	.387817	.340461	.299246	.263331
15	.362446	.315242	.274538	.239392
16	.338735	.291890	.251870	.217629
17	.316574	.270269	.231073	.197845
18	.295864	.250249	.211994	.179859
19	.276508	.231712	.194490	.163508
20	.258419	.214548	.178431	.148644
21	.241513	.198656	.163698	.135131
22	.225713	.183941	.150182	.122846
23	.210947	.170315	.137781	.111678
24	.197147	.157690	.126405	.101526
25	.184249	.146018	.115968	.092296
26	.172195	.135202	.106393	.083905
27	.160930	.125187	.097608	.076278
28	.150402	.115914	.089548	.069343
29	.140563	.107328	.082155	.063039
30	.131367	.099377	.075371	.057309
31	.122773	.092016	.069148	.052099
32	.114741	.085200	.063438	.047362
33	.107235	.078889	.058200	.043057
34	.100219	.073045	.053395	.039143
35	.093663	.067635	.048986	.035584
36	.087535	.062625	.044941	.032349
37	.081809	.057986	.041231	.029408
38	.076457	.053690	.037826	.026735
39	.071455	.049713	.034703	.024304
40	.066780	.046031	.031838	.022095
41	.062412	.042621	.029209	.020086
42	.058329	.039464	.026797	.018260
43	.054513	.036541	.024584	.016600
44	.050946	.033834	.022555	.015091
45	.047613	.031328	.020692	.013719
46	.044499	.029007	.018984	.012472
47	.041587	.026859	.017416	.011338
48	.038867	.024869	.015978	.010307
49	.036324	.023027	.014659	.009370
50	.033948	.021321	.013449	.008519

PRESENT VALUE OF ONE DOLLAR *PER ANNUM* \*

AT END OF EACH YEAR—FOR FROM ONE TO FIFTY.

End of Year.	4 per cent.	4½ per cent.	5 per cent.	6 per cent.
1	0.9615	0.9569	0.9524	0.9434
2	1.8861	1.8727	1.8594	1.8334
3	2.7751	2.7490	2.7232	2.6730
4	3.6299	3.5875	3.5460	3.4651
5	4.4518	4.3900	4.3295	4.2124
6	5.2421	5.1579	5.0757	4.9173
7	6.0021	5.3927	5.7864	5.5824
8	6.7327	6.5959	6.4632	6.2098
9	7.4353	7.2688	7.1078	6.8017
10	8.1109	7.9127	7.7217	7.3601
11	8.7605	8.5289	8.3064	7.8869
12	9.3851	9.1186	8.8633	8.3838
13	9.9856	9.6829	9.3936	8.8527
14	10.5631	10.2228	9.8986	9.2950
15	11.1184	10.7395	10.3797	9.7122
16	11.6523	11.2340	10.8378	10.1059
17	12.1657	11.7072	11.2741	10.4773
18	12.6593	12.1600	11.6896	10.8276
19	13.1339	12.5933	12.0853	11.1581
20	13.5903	13.0079	12.4622	11.4699
21	14.0292	13.4047	12.8212	11.7641
22	14.4511	13.7844	13.1630	12.0416
23	14.8568	14.1478	13.4886	12.3034
24	15.2470	14.4955	13.7986	12.5504
25	15.6221	14.8282	14.0939	12.7834
26	15.9828	15.1466	14.3752	13.0032
27	16.3296	15.4513	14.6430	13.2105
28	16.6631	15.7429	14.8981	13.4062
29	16.9837	16.0219	15.1411	13.5907
30	17.2920	16.2889	15.3725	13.7648
31	17.5885	16.5444	15.5928	13.9291
32	17.8736	16.7889	15.8027	14.0840
33	18.1476	17.0229	16.0025	14.2302
34	18.4112	17.2468	16.1929	14.3681
35	18.6646	17.4610	16.3742	14.4982
36	18.9083	17.6660	16.5469	14.6210
37	19.1426	17.8622	16.7113	14.7368
38	19.3679	18.0500	16.8679	14.8460
39	19.5845	18.2297	17.0170	14.9491
40	19.7928	18.4016	17.1591	15.0463
41	19.9931	18.5661	17.2944	15.1380
42	20.1856	18.7236	17.4232	15.2245
43	20.3708	18.8742	17.5459	15.3062
44	20.5488	19.0184	17.6628	15.3832
45	20.7200	19.1563	17.7741	15.4558
46	20.8847	19.2884	17.8801	15.5244
47	21.0429	19.4147	17.9810	15.5890
48	21.1951	19.5256	18.0772	15.6500
49	21.3415	19.6313	18.1687	15.7076
50	21.4822	19.7620	18.2559	15.7619

\* Sometimes called an "Annuity Certain."



## MONETARY TABLES.

13

PRESENT VALUE OF ONE DOLLAR *PER ANNUM*

(Continued).

Years.	7 per cent.	8 per cent.	9 per cent.	10 per cent.
1	.9346	.9259	.9174	.9091
2	1.8080	1.7833	1.7591	1.7355
3	2.6243	2.5771	2.5313	2.4869
4	3.3872	3.3121	3.2397	3.1699
5	4.1002	3.9927	3.8897	3.7908
6	4.7665	4.6229	4.4859	4.3553
7	5.3893	5.2064	5.0330	4.8684
8	5.9713	5.7466	5.5348	5.3349
9	6.5152	6.2469	5.9952	5.7590
10	7.0236	6.7101	6.4177	6.1446
11	7.4987	7.1390	6.8052	6.4951
12	7.9427	7.5361	7.1607	6.8137
13	8.3577	7.9038	7.4869	7.1034
14	8.7455	8.2442	7.7862	7.3667
15	9.1079	8.5595	8.0607	7.6061
16	9.4466	8.8514	8.3126	7.8237
17	9.7632	9.1216	8.5436	8.0216
18	10.0591	9.3719	8.7556	8.2014
19	10.3356	9.6036	8.9501	8.3649
20	10.5940	9.8181	9.1285	8.5136
21	10.8355	10.0168	9.2922	8.6487
22	11.0612	10.2007	9.4424	8.7715
23	11.2722	10.3711	9.5802	8.8832
24	11.4693	10.5288	9.7066	8.9847
25	11.6536	10.6748	9.8226	9.0770
26	11.8258	10.8100	9.9290	9.1609
27	11.9867	10.9352	10.0266	9.2372
28	12.1371	11.0511	10.1161	9.3066
29	12.2777	11.1584	10.1983	9.3696
30	12.4090	11.2578	10.2737	9.4269
31	12.5318	11.3498	10.3428	9.4790
32	12.6466	11.4350	10.4062	9.5264
33	12.7538	11.5139	10.4644	9.5694
34	12.8540	11.5869	10.5178	9.6086
35	12.9477	11.6546	10.5668	9.6442
36	13.0352	11.7172	10.6118	9.6765
37	13.1170	11.7752	10.6530	9.7059
38	13.1935	11.8289	10.6908	9.7327
39	13.2649	11.8786	10.7255	9.7570
40	13.3317	11.9246	10.7574	9.7791
41	13.3941	11.9672	10.7866	9.7991
42	13.4524	12.0067	10.8134	9.8174
43	13.5070	12.0432	10.8380	9.8340
44	13.5579	12.0771	10.8605	9.8491
45	13.6055	12.1084	10.8812	9.8628
46	13.6500	12.1374	10.9002	9.8753
47	13.6916	12.1643	10.9176	9.8866
48	13.7305	12.1891	10.9336	9.8969
49	13.7668	12.2122	10.9482	9.9063
50	13.8007	12.2335	10.9617	9.9148

# LIFE TABLES.

---

A LARGE number of Life Tables have been constructed, but few of which have any practical interest now.

The NORTHAMPTON TABLE, the first used as a basis for Life Insurance, was formed by Dr. Price, from observations on the deaths from 1735 to 1780 in the town of Northampton, England, and is even now the basis of the premium tables of many English Companies. It is, however, no longer used for valuations, as it is universally admitted that it states the mortality at the younger and middle ages entirely too high. It has never been used in this country except by the Courts in settling life-interests.

The CARLISLE TABLE, constructed by Mr. Milne, from observations for eight years prior to 1787, in the town of Carlisle, England, has been for a long time a most popular table. In England it is generally the basis of valuations, and the premiums of many American Companies are derived from it. Despite its general correctness, it has many irregularities and inconsistencies; thus, it makes the rate of mortality greater at 45 than at 50, for which there can be no explanation.

The ACTUARIES' OR COMBINED EXPERIENCE TABLE was formed from the experience of seventeen prominent English Companies, and published in 1843\*; it is well graduated and very reliable for Life Insurance Companies; it was made the standard table for Massachusetts in 1858.

The FARR TABLE, No. 3, is the third constructed by Dr. Farr, from observations on the mortality of the whole population of England; it was published in 1864, and was the legal valuation table for the State of New York from 1866 to 1868. It is not well graduated, and does not represent the mortality among selected lives.

The AMERICAN TABLE, constructed from the experience of the "Mutual Life" of N. Y., by Sheppard Homans, its Actuary, was adopted by the State of New York with  $4\frac{1}{2}$  per cent. interest in 1868, and had been employed by that Company in its annual valuations for several years previously. Though lower than the Actuaries' Table, except below 30 and above 75, its rate of mortality is from 20 to 30 per cent. higher than the experience of all the Companies doing business in Massachusetts (from 1859 to '65 inclusive), and is therefore safe as well as liberal for State purposes.

\* The subsequent experience of English Companies is a remarkable confirmation of the correctness of this Table.

## THE NUMBER SURVIVING

TO EACH AGE, OUT OF THE NUMBER LIVING AT THE YOUNGEST AGE, ACCORDING TO VARIOUS TABLES.

Age.	Farr No. 3 Males.	Actuaries' or Combined Exp.	American.	Age.	Farr No. 3 Males.	Actuaries' or Combined Exp.	American.
0	511,745	.....	.....	52	224,195	67,253	67,841
1	428,026	.....	.....	53	219,437	66,046	66,797
2	400,505	.....	.....	54	214,552	64,785	65,706
3	386,290	.....	.....	55	209,539	63,469	64,563
4	377,077	.....	.....	56	204,395	62,094	63,364
5	370,358	.....	.....	57	199,114	60,658	62,104
6	365,325	.....	.....	58	193,686	59,161	60,779
7	361,372	.....	.....	59	188,102	57,600	59,385
8	358,062	.....	.....	60	182,350	55,973	57,917
9	355,328	.....	.....	61	176,421	54,275	56,371
10	353,031	100,000	100,000	62	170,303	52,505	54,743
11	351,048	99,324	99,251	63	163,989	50,661	53,030
12	349,272	98,650	98,505	64	157,474	48,744	51,230
13	347,606	97,978	97,762	65	150,735	46,754	49,341
14	345,969	97,307	97,022	66	143,833	44,693	47,361
15	344,290	96,636	96,285	67	136,718	42,565	45,291
16	342,509	95,965	95,550	68	129,421	40,374	43,133
17	340,581	95,293	94,818	69	121,965	38,128	40,890
18	338,469	94,620	94,089	70	114,370	35,837	38,569
19	336,149	93,945	93,362	71	106,675	33,510	36,178
20	333,608	93,268	92,637	72	98,919	31,159	33,730
21	330,844	92,588	91,914	73	91,149	28,797	31,243
22	328,043	91,905	91,192	74	83,416	26,439	28,738
23	325,207	91,219	90,471	75	75,777	24,100	26,237
24	322,339	90,529	89,751	76	68,294	21,797	23,761
25	319,442	89,835	89,032	77	61,026	19,548	21,330
26	316,516	89,137	88,314	78	54,036	17,369	18,961
27	313,562	88,434	87,596	79	47,381	15,277	16,670
28	310,581	87,726	86,878	80	41,115	13,290	14,474
29	307,572	87,012	86,160	81	35,283	11,424	12,383
30	304,534	86,292	85,441	82	29,922	9,694	10,419
31	301,466	85,565	84,721	83	25,060	8,112	8,603
32	298,366	84,831	84,000	84	20,711	6,685	6,955
33	295,232	84,089	83,277	85	16,877	5,417	5,485
34	292,061	83,339	82,551	86	13,549	4,306	4,193
35	288,850	82,581	81,822	87	10,709	3,348	3,079
36	285,596	81,814	81,090	88	8,325	2,537	2,146
37	282,296	81,038	80,353	89	6,360	1,864	1,402
38	278,944	80,253	79,611	90	4,770	1,319	847
39	275,538	79,458	78,862	91	3,510	892	462
40	272,073	78,653	78,106	92	2,531	570	216
41	268,544	77,838	77,341	93	1,787	339	79
42	264,948	77,012	76,567	94	1,234	184	21
43	261,280	76,173	75,782	95	833	89	3
44	257,534	75,316	74,985	96	548	37	0
45	253,708	74,435	74,173	97	352	13	.....
46	249,796	73,526	73,345	98	220	4	.....
47	245,795	72,582	72,497	99	134	1	.....
48	241,700	71,601	71,627	100	79	0	.....
49	237,508	70,580	70,731	*	*	.....	.....
50	233,216	69,517	69,804	108	0	.....	.....
51	228,821	68,409	68,842	.....	.....	.....	.....

## Expectations by Various Tables.

The "Expectation" at any age is the average after-lifetime of all the persons at that age, reckoned to the *middle* of the year that each may die.

Age.	Northampton.	Carlisle.	Farr No. 3 Males.	Actuaries' or Combined Ex- perience.	American, (N. Y. State.)	Age.
0	25.2	38.7	39.9	.....	.. ...	0
1	32.7	44.7	46.7	.....	.....	1
5	40.8	51.2	49.7	.....	.....	5
10	39.8	48.8	47.1	48.4	48.7	10
15	36.5	45.0	43.2	45.0	45.5	15
20	33.4	41.5	39.5	41.5	42.2	20
25	30.9	37.9	36.1	38.0	38.8	25
30	28.3	34.3	32.8	34.4	35.3	30
35	25.7	31.0	29.4	30.9	31.8	35
40	23.1	27.6	26.1	27.3	28.2	40
45	20.5	24.5	22.8	23.7	24.5	45
50	18.0	21.1	19.5	20.2	20.9	50
55	15.6	17.6	16.5	16.9	17.4	55
60	13.2	14.3	13.5	13.8	14.1	60
65	10.9	11.8	10.8	11.0	11.1	65
70	8.6	9.2	8.5	8.5	8.5	70
75	6.5	7.0	6.5	6.5	6.3	75
80	4.8	5.5	4.9	4.8	4.4	80

The Expectation at any age from 20 to 60 can be estimated quite closely by subtracting the age from 80, and taking two-thirds of the difference.

A table of Expectations is more interesting than useful, as it cannot be used for anything more than a vague estimate, and is therefore never employed in calculations. The reason of this is, that the average time cannot be employed for compound interest as it may be for simple interest, as will be seen from this example:

If three payments of \$100.00 each are due at the end of 10, 20 and 30 years respectively—and their present value is required—we shall find it as follows, taking each payment separately:

Page 10, 6 per cent.	Present value of 1st payment at end of 10 years, \$55.84					
	"	"	2d	"	"	20
			3d	"	"	30
						17.41
						104.43

The assumption that the three payments are equivalent to one of \$300.00 at the end of the average time of 20 years, would make the total present value, \$93.54, and is therefore clearly wrong.

Tyro Actuaries must remember this fact, as the use of the "Expectation" has led to the discovery of innumerable mares' nests.

People often think that, because the Expectation at age 25 (Actuaries' Table) is 38 years, the present value of \$1,000 payable at the death of a person of that age, must be the present value of that sum discounted for that time; thus, taking interest at 4 per cent., they make the present value \$225.29 (page 10).

This reasoning would be correct, if money were accumulated at simple interest; but where compound interest operates, all calculations involving different times must be made independently. The correct method of computation in the last Example will be easily understood from the following.

The number of persons supposed to be living at age 25 (page 15) is 89,835. To find what sum must be on hand, invested at 4 per cent., to enable a company to pay \$1,000 at the death of each of these persons, we proceed as follows:

The number living at age 26 is 698 less than the original number, so that the company will have to pay \$698,000 the first year; assuming, for convenience, that the claims are not to be paid until the end of the year in which they occur, it is clear that the company must have on hand the present value of \$698,000, discounted for one year at 4 per cent. Page 10 shows that this is.... \$671,153.53

The death-claims of the second year in like manner will be \$703,000, which, discounted for two years, is..... 649,962.87

The third year, in like manner, requires a reserve of..... 629,409.17  
and so on to the 75th year, in which the last is supposed to die. " " "

The sum of all these present values is.....\$24,867,855.70

This, divided by the original number insured, gives \$276.82, which is, therefore, the sum that each person should contribute at the beginning of the insurance, and it will be noticed that it is about one-fourth larger than the value, as incorrectly estimated, at the top of the page.

Most people also incorrectly suppose that the annual premium to insure \$1,000 on a person aged 25, is the sum which invested annually for 38 years will amount to \$1,000, and which we find from page 8 is \$11.18.

The correct method of calculation will be easily understood from the following explanation:

We have just found the present value or single premium for \$1,000, payable at the death of a person aged 25. The point now is, to find what annual payment during his life, has a present value equal to \$276.82. To do this, we must have the present value of an annuity of \$1.00, payable at the beginning of each year of his life. This we find in the same manner as the single premium (taking the living instead of the dying, however), to be \$18.803; dividing \$276.82 by this gives us \$14.72, the true annual premium.

# PER-CENTAGE OF MORTALITY ACCORDING TO VARIOUS TABLES.

Age.	Carlisle.	Farr No. 3. Males.	Actuaries.	American Experience.	Mass. Exp. 7 yrs.—'59-'65. Unadjusted.	Age.
0	15.3900	16.3595				0
1	8.0605	6.4297				1
2	6.4918	3.5493				2
3	3.7943	2.3850				3
4	2.8723	1.7819				4
5	1.7810	1.3590				5
6	1.2283	1.0821				6
7	0.8796	0.9160				7
8	.6579	.7636				8
9	.5082	.6464				9
10	0.4489	0.5617	0.6760	0.7490	3.38	10
11	.4820	.5059	.6786	.7516	.....	11
12	.5000	.4770	.6812	.7542	4.63	12
13	.5182	.4709	.6848	.7569	.....	13
14	.5525	.4853	.6896	.7596	.....	14
15	0.6191	0.5173	0.6944	0.7633	1.52	15
16	.6708	.5629	.7003	.7660	.....	16
17	.6914	.6201	.7062	.7688	1.21	17
18	.6962	.6854	.7134	.7726	1.21	18
19	.7011	.7559	.7206	.7765	0.61	19
20	0.7061	0.8285	0.7291	0.7804	0.92	20
21	.6946	.8466	.7377	.7855	.90	21
22	.6994	.8645	.7464	.7906	.92	22
23	.7043	.8819	.7564	.7958	.67	23
24	.7093	.8987	.7666	.8011	.82	24
25	0.7314	0.9160	0.7770	0.8064	0.70	25
26	.7368	.9333	.7887	.8130	.67	26
27	.7768	.9507	.8006	.8196	.66	27
28	.8699	.9688	.8139	.8264	.67	28
29	.9828	.9877	.8275	.8344	.68	29
30	1.0103	1.0074	0.8425	0.8426	0.74	30
31	1.0206	1.0283	.8578	.8510	.80	31
32	1.0130	1.0504	.8747	.8607	.68	32
33	1.0051	1.0741	.8919	.8717	.60	33
34	1.0151	1.0994	.9095	.8830	.81	34
35	1.0257	1.1265	0.9288	0.8946	0.74	35
36	1.0552	1.1555	.9485	.9088	.63	36
37	1.0855	1.1874	.9687	.9234	.65	37
38	1.1167	1.2210	.9906	.9408	.82	38
39	1.1877	1.2575	1.0131	.9586	.85	39
40	1.3005	1.2971	1.0362	0.9794	0.87	40
41	1.3775	1.3391	1.0612	1.0008	.78	41
42	1.4373	1.3844	1.0894	1.0252	.84	42
43	1.4582	1.4337	1.1251	1.0517	.79	43
44	1.4798	1.4856	1.1697	1.0829	.94	44
45	1.4809	1.5419	1.2212	1.1163	0.85	45
46	1.4816	1.6017	1.2839	1.1562	.97	46
47	1.4603	1.6660	1.3516	1.2000	.92	47
48	1.3935	1.7344	1.4260	1.2509	1.03	48
49	1.3683	1.8071	1.5061	1.3106	0.96	49

# PER-CENTAGE OF MORTALITY ACCORDING TO VARIOUS TABLES.

(Continued).

Age.	Carlisle.	Farr No. 3. Males.	Actuaries.	American Experience.	Mass. Exp. 7 yrs.—'59-'65. Unadjusted.	Age.
50	1.3418	1.8845	1.5938	1.3781	0.97	50
51	1.4292	2.0217	1.6898	1.4541	1.01	51
52	1.5201	2.1223	1.7947	1.5389	1.06	52
53	1.6148	2.2262	1.9093	1.6333	1.31	53
54	1.6896	2.3365	2.0313	1.7396	1.80	54
55	1.7923	2.4549	2.1664	1.8571	1.21	55
56	1.9000	2.5837	2.3126	1.9885	1.33	56
57	2.0897	2.7261	2.4679	2.1335	1.65	57
58	2.4206	2.8830	2.6386	2.2936	1.70	58
59	2.8274	3.0579	2.8246	2.4720	1.98	59
60	3.3489	3.2514	3.0336	2.6693	2.09	60
61	3.5785	3.4678	3.2612	2.8880	2.08	61
62	3.7408	3.7075	3.5121	3.1292	1.89	62
63	3.8250	3.9728	3.7840	3.3943	2.75	63
64	3.9771	4.2674	4.0826	3.6873	2.50	64
65	4.1087	4.5909	4.4082	4.0129	3.51	65
66	4.2502	4.9467	4.7614	4.3707	3.01	66
67	4.4388	5.3373	5.1474	4.7647	4.02	67
68	4.6450	5.7626	5.5630	5.2002	4.26	68
69	4.9109	6.2257	6.0087	5.6762	3.31	69
70	5.1645	6.7282	6.4933	6.1993	6.80	70
71	5.8849	7.2707	7.0158	6.7665	5.00	71
72	6.8129	7.8549	7.5805	7.3733	6.84	72
73	7.8117	8.4839	8.1884	8.0178	6.14	73
74	9.0168	9.1577	8.8468	8.7028	4.58	74
75	9.5522	9.8750	9.5560	9.4371	4.50	75
76	10.2970	10.6422	10.3180	10.2311	7.53	76
77	10.7432	11.4541	11.1469	11.1064	11.31	77
78	10.8821	12.3159	12.0444	12.0827	11.69	78
79	11.8409	13.2247	13.0065	13.1734	15.88	79
80	12.1721	14.1846	14.0406	14.4466	8.99	80
81	13.3811	15.1943	15.1436	15.8605	10.91	81
82	14.0690	16.2489	16.3194	17.4297	30.30	82
83	15.0883	17.3543	17.5913	19.1561	8.00	83
84	15.8790	18.5119	18.9678	21.1359	.....	84
85	17.5281	19.7191	20.5095	23.5552	14.82	85
86	19.3461	20.9610	22.2480	26.5681	18.18	86
87	21.6216	22.2617	24.2234	30.3020	.....	87
88	21.9828	23.6036	26.5274	34.6692	.....	88
89	21.5470	25.0000	29.2382	39.5863	.....	89
90	26.0563	26.4151	32.3730	45.4546		90
91	28.5714	27.8917	36.0987	53.2468		91
92	28.0000	29.4059	40.5263	63.4259		92
93	25.9259	30.9457	45.7227	73.4177		93
94	25.0000	32.4959	51.6304	85.7143		94
95	23.3333	34.2137	58.4270			95
96	21.7391	35.7664	64.8649			96
97	22.2222	37.5000	69.2308			97
98	21.4286	39.0909	75.0000			98
99	18.1818	41.0448	100.0000			99

## ANNUITIES.

PRESENT VALUE OF \$1.00 PER ANNUM, TO BE RECEIVED AT THE END OF EVERY YEAR THAT A PERSON NOW AGED FROM 25 TO 75 MAY BE LIVING.

Age.	Actuaries' or Combined Experience.			Farr No. 3, 5 per cent.		Age.
	4 per cent.	5 per cent.	6 per cent.	Males.	Females.	
25	17.803	15.442	13.576	14.994	15.076	25
26	17.660	15.341	13.503	14.889	14.983	26
27	17.512	15.236	13.427	14.781	14.888	27
28	17.360	15.127	13.347	14.669	14.790	28
29	17.202	15.014	13.264	14.553	14.690	29
30	17.040	14.896	13.177	14.433	14.586	30
31	16.872	14.774	13.087	14.309	14.479	31
32	16.698	14.647	12.992	14.180	14.368	32
33	16.520	14.515	12.893	14.047	14.254	33
34	16.335	14.378	12.789	13.910	14.135	34
35	16.144	14.235	12.681	13.768	14.013	35
36	15.948	14.087	12.568	13.621	13.886	36
37	15.744	13.933	12.450	13.469	13.754	37
38	15.534	13.773	12.326	13.312	13.618	38
39	15.317	13.606	12.196	13.151	13.476	39
40	15.093	13.433	12.060	12.984	13.329	40
41	14.861	13.252	11.918	12.813	13.176	41
42	14.621	13.064	11.768	12.636	13.018	42
43	14.374	12.868	11.612	12.454	12.853	43
44	14.119	12.666	11.448	12.267	12.682	44
45	13.857	12.456	11.279	12.074	12.505	45
46	13.590	12.241	11.104	11.877	12.320	46
47	13.317	12.020	10.923	11.673	12.128	47
48	13.039	11.794	10.737	11.465	11.928	48
49	12.757	11.563	10.546	11.250	11.720	49
50	12.470	11.326	10.349	11.030	11.503	50
51	12.179	11.085	10.148	10.804	11.277	51
52	11.884	10.840	9.942	10.579	11.042	52
53	11.585	10.590	9.731	10.348	10.796	53
54	11.283	10.336	9.515	10.113	10.540	54
55	10.978	10.077	9.295	9.873	10.289	55
56	10.670	9.816	9.071	9.627	10.035	56
57	10.359	9.550	8.843	9.377	9.777	57
58	10.046	9.282	8.611	9.121	9.516	58
59	9.731	9.010	8.375	8.862	9.252	59
60	9.415	8.745	8.136	8.598	8.984	60
61	9.098	8.459	7.893	8.332	8.714	61
62	8.780	8.182	7.649	8.063	8.441	62
63	8.464	7.903	7.403	7.792	8.166	63
64	8.149	7.625	7.156	7.520	7.890	64
65	7.835	7.347	6.908	7.248	7.613	65
66	7.525	7.070	6.660	6.976	7.336	66
67	7.217	6.795	6.413	6.706	7.061	67
68	6.913	6.521	6.167	6.439	6.787	68
69	6.613	6.251	5.922	6.174	6.515	69
70	6.317	5.983	5.678	5.913	6.247	70
71	6.026	5.718	5.437	5.657	5.982	71
72	5.740	5.457	5.198	5.405	5.722	72
73	5.459	5.200	4.962	5.159	5.467	73
74	5.184	4.947	4.729	4.919	5.217	74
75	4.915	4.699	4.499	4.686	4.974	75



# Net Single Premium for — or Present Value of \$1,000.

PAYABLE AS BELOW, ACCORDING TO THE ACTUARIES' TABLE AND 4 PER CENT. INTEREST.

Present Age.	At Death only.	At Death, or age 65.	At Death, or age 60.	At Death, or age 55.	At Death, or age 50.	At Death, or age 45.	Present Age.
20	251.91	281.07	301.98	331.35	370.97	422.98	20
21	256.56	287.12	309.02	339.80	381.30	435.78	21
22	261.38	293.40	316.34	348.58	392.06	449.15	22
23	266.36	299.90	323.95	357.73	403.29	463.11	23
24	271.50	306.65	331.85	367.25	415.00	477.68	24
25	276.82	313.66	340.07	377.17	427.21	492.90	25
26	282.31	320.93	348.61	387.50	439.94	508.80	26
27	287.99	328.47	357.48	398.25	453.23	525.41	27
28	293.86	336.29	366.71	409.45	467.09	542.77	28
29	299.91	344.41	376.30	421.12	481.56	560.91	29
30	306.17	352.83	386.28	433.27	496.65	579.87	30
31	312.62	361.56	396.65	445.94	512.41	599.69	31
32	319.29	370.63	407.43	459.15	528.87	620.42	32
33	326.17	380.03	418.64	472.89	546.05	642.10	33
34	333.27	389.79	430.31	487.23	564.00	664.80	34
35	340.60	399.92	442.45	502.19	582.77	688.56	35
36	348.17	410.44	455.08	517.80	602.39	713.44	36
37	355.99	421.37	468.24	534.10	622.90	739.51	37
38	364.07	432.73	481.95	551.11	644.38	766.83	38
39	372.42	444.54	496.24	568.89	666.85	795.47	39
40	381.04	456.82	511.14	587.46	690.39	825.53	40
41	389.96	469.59	526.68	606.89	715.05	857.07	41
42	399.18	482.89	542.90	627.21	740.90	890.18	42
43	408.71	496.72	559.82	648.47	768.01	924.97	43
44	418.52	511.09	577.46	670.70	796.44	961.54	44
45	428.57	525.99	595.83	693.95	826.27		45
46	438.86	541.43	614.96	718.27	857.58		46
47	449.35	557.40	634.87	743.71	890.48		47
48	460.02	573.94	655.61	770.35	925.08		48
49	470.88	591.07	677.23	798.29	961.54		49
50	481.91	608.82	699.80	827.62			
51	493.11	627.23	723.38	858.47			
52	504.46	646.34	748.06	890.97			
53	515.95	666.21	773.92	925.26			
54	527.57	686.88	801.08	961.54			
55	539.31	708.43	829.66				
56	551.16	730.94	859.81				
57	563.10	754.50	891.70				
58	575.14	779.23	925.53				
59	587.26	805.26	961.54				
60	599.43	832.74					
61	611.63	861.86					
62	623.83	892.84					
63	636.00	925.96					
64	648.12	961.54					
65	660.17						
66	672.13						
67	683.96						
68	695.66						
69	707.19						
70	718.57						

The net present cash value of reversionary dividends may be found from this table: thus we see that if a person aged 45 has a reversionary addition of \$100 payable with his policy at "Death or 60," the net or mathematical cash value of the same is \$59.58;—the Company, however, may have good reasons for not allowing him quite this full amount for giving up the reversionary addition.

For Values of sums payable at "Death or 40," take the values of the same as if payable at "Death or 45" on the life of a person five years older: and in general,

To find the value for cases not given above: Take the nearest case given, with the same interval between the present age and that of the endowment. Thus, for age 40 payable at "Death or 52," take age 38 payable at "Death or 50," as that also has twelve years to run.

# Net Reversionary Value, Payable as Below.

CORRESPONDING TO \$1 IN PRESENT CASH—ACTUARIES' TABLE, WITH 4 PER CENT. INTEREST.

Present Age.	At Death only.	At Death, or age 65.	At Death, or age 60.	At Death, or age 55.	At Death, or age 50.	At Death, or age 45.	Present Age.
20	3.970	3.558	3.312	3.018	2.696	2.364	20
21	3.898	3.483	3.236	2.943	2.623	2.295	21
22	3.826	3.408	3.161	2.869	2.551	2.226	22
23	3.754	3.334	3.087	2.795	2.480	2.159	23
24	3.683	3.261	3.013	2.723	2.410	2.093	24
25	3.613	3.188	2.941	2.651	2.341	2.029	25
26	3.542	3.116	2.869	2.581	2.273	1.965	26
27	3.472	3.044	2.797	2.511	2.206	1.903	27
28	3.403	2.974	2.727	2.442	2.141	1.842	28
29	3.334	2.904	2.657	2.375	2.077	1.783	29
30	3.266	2.834	2.589	2.308	2.014	1.725	30
31	3.199	2.772	2.521	2.243	1.952	1.668	31
32	3.132	2.698	2.454	2.178	1.891	1.612	32
33	3.066	2.631	2.389	2.115	1.831	1.557	33
34	3.001	2.566	2.324	2.052	1.773	1.504	34
35	2.936	2.501	2.260	1.991	1.716	1.452	35
36	2.872	2.436	2.197	1.931	1.660	1.402	36
37	2.809	2.373	2.136	1.872	1.605	1.352	37
38	2.747	2.311	2.075	1.815	1.552	1.304	38
39	2.685	2.250	2.015	1.758	1.500	1.257	39
40	2.624	2.189	1.956	1.702	1.449	1.211	40
41	2.564	2.130	1.899	1.648	1.399	1.167	41
42	2.505	2.071	1.842	1.594	1.350	1.123	42
43	2.447	2.013	1.786	1.542	1.302	1.081	43
44	2.389	1.957	1.732	1.491	1.256	1.040	44
45	2.333	1.901	1.678	1.441	1.210		45
46	2.279	1.847	1.626	1.392	1.166		46
47	2.226	1.794	1.575	1.345	1.123		47
48	2.174	1.742	1.525	1.298	1.081		48
49	2.124	1.692	1.477	1.253	1.040		49
50	2.075	1.643	1.429	1.208			
51	2.028	1.594	1.382	1.165			
52	1.982	1.547	1.337	1.122			
53	1.938	1.501	1.292	1.081			
54	1.896	1.456	1.248	1.040			
55	1.854	1.412	1.205				
56	1.814	1.368	1.163				
57	1.776	1.325	1.122				
58	1.739	1.283	1.081				
59	1.703	1.242	1.040				
60	1.668	1.201					
61	1.635	1.160					
62	1.603	1.120					
63	1.572	1.080					
64	1.543	1.040					
65	1.515						
66	1.488						
67	1.462						
68	1.438						
69	1.414						
70	1.392						

This Table shows the amount of reversionary addition theoretically equivalent to a cash dividend of \$1.00:

Thus, if a person aged 45, insured under an Endowment payable at "Death or 60," has a cash dividend of \$10, he is theoretically entitled to have \$16.78 added to his policy, in lieu of the cash; in practice, however, the company may think proper not to add quite so much by 5 or 10 per cent.

For the value payable at "Death or 40," take the value for a person five years older, payable at "Death or 45," and in general,

To find the value in cases not given above: Take the nearest case given, with the same interval between the present age and that of endowment. Thus, for age 40 payable at "Death or 52," take age 38 payable at "Death or 50," as that also has twelve years to run.

## SKELETON TABLE

OF

## Net Premiums for All Forms of Insurance,

ACCORDING TO THE ACTUARIES' (OR COMBINED EXPERIENCE) TABLE, AT 4 PER CENT

Form of Insurance.	Net Premium at Ages.																																				
	20	25	30	35	40	45	50	55	60																												
<b>Whole Life Insurance.</b>																																					
Ordinary Annual.....	12.95	14.72	16.97	19.87	23.63	28.85	35.78	45.03	57.56																												
Twenty Payments.....	19.00	21.00	23.39	26.32	29.98	34.78	41.02	49.24	60.49																												
Fifteen ".....	22.85	25.21	28.03	31.40	35.53	40.78	47.38	55.69	66.60																												
Ten ".....	30.82	33.94	37.66	42.06	47.34	53.86	61.74	71.14	82.68																												
Five ".....	55.19	60.70	67.23	74.92	84.00	94.88	107.53	121.78	137.84																												
Single ".....	251.91	276.82	306.17	340.60	381.04	428.57	481.91	539.31	599.43																												
<b>Short Term Insurance.</b>																																					
Seven Years.....	7.27	7.82	8.55	9.50	10.89	13.69	18.28	25.24	36.03																												
<b>Ordinary Endowment Ins.</b>																																					
Payable at Death or in 5 years..	180.61	180.82	181.12	181.50	181.98	182.92	184.66	187.34	191.49																												
" " 10 " ..	83.86	84.15	84.54	85.03	85.76	87.21	89.66	93.45	99.47																												
" " 15 " ..	52.27	52.62	53.08	53.72	54.77	56.70	59.86	64.80	72.64																												
" " 20 " ..	36.97	37.39	37.95	38.80	40.21	42.68	46.65	52.84																													
" " 25 " ..	28.19	28.69	29.41	30.52	32.35	35.42	40.27																														
" " 30 " ..	22.68	23.29	24.21	25.63	27.92	31.63																															
<b>Ten-Payment Endowment Insurance.</b>																																					
Payable at Death or in 15 years..	70.47	70.84	71.32	71.97	72.98	74.88	78.00	82.78	90.18																												
" " 20 " ..	59.95	60.44	61.09	62.02	63.50	66.10	70.22	76.34																													
" " 25 " ..	51.74	52.38	53.29	54.64	56.75	60.25	65.53																														
" " 30 " ..	45.38	46.25	47.51	49.39	52.25	56.71																															
<b>Temporary Ins. &amp; Deferred Annuity.</b>																																					
<i>Insurance, \$1,000. Annuity, \$100.</i>																																					
Premiums ceasing at the end of the term of insurance.	<table> <tr> <td rowspan="3">{</td><td>Term of 10 yrs</td><td>.....</td><td>.....</td><td>.....</td><td>111.50</td><td>101.53</td><td>92.55</td><td>85.80</td><td>83.47</td></tr> <tr> <td>" " 20 "</td><td>.....</td><td>47.70</td><td>44.16</td><td>41.27</td><td>39.97</td><td>41.28</td><td></td><td></td></tr> <tr> <td>" " 30 "</td><td>27.55</td><td>25.95</td><td>24.73</td><td>24.33</td><td>25.42</td><td></td><td></td><td></td></tr> </table>									{	Term of 10 yrs	.....	.....	.....	111.50	101.53	92.55	85.80	83.47	" " 20 "	.....	47.70	44.16	41.27	39.97	41.28			" " 30 "	27.55	25.95	24.73	24.33	25.42			
{	Term of 10 yrs	.....	.....	.....	111.50	101.53	92.55	85.80	83.47																												
	" " 20 "	.....	47.70	44.16	41.27	39.97	41.28																														
	" " 30 "	27.55	25.95	24.73	24.33	25.42																															
<b>Simple Endowment Ins.</b>																																					
Pay'ble only if alive after 10 yrs.	.....	.....	.....	.....	74.17	72.39	69.69	65.65	59.66																												
" " 20 " ..	.....	.....	28.09	27.10	25.55	23.26																															
" " 30 " ..	14.05	13.45	12.53	11.19																																	

Premiums are calculated on the hypothesis that claims are not to be paid until the end of the policy-year, or at the next anniversary of the issue of the policy; in practice, Companies pay in from one to three months after death, and thus lose from three to five months' interest on the average.

In practice, the *net* or *mathematical* premiums are increased by a margin or "loading" to provide for expenses and contingencies.

## SKELETON TABLE

OF

## Net Premiums for All Forms of Insurance,

ACCORDING TO THE ACTUARIES' TABLE, AT 5 PER CENT.

Form of Insurance.	Net Premium at Ages.								
	20	25	30	35	40	45	50	55	60
Whole Life Insurance.									
Ordinary Annual.....	11.58	13.20	15.29	18.02	21.67	26.70	33.51	42.65	55.10
Twenty Payments.....	15.90	17.73	20.00	22.83	26.45	31.29	37.65	46.04	57.49
Fifteen ".....	18.81	20.94	23.57	26.80	30.86	36.16	42.91	51.47	62.70
Ten ".....	24.89	27.67	31.08	35.24	40.38	46.91	54.97	64.70	76.73
Five ".....	43.65	48.46	54.34	61.48	70.19	80.98	93.82	108.61	125.54
Single ".....	195.65	217.04	243.03	274.51	312.72	359.23	413.02	472.50	536.41
Short Term Insurance.									
Seven Years.....	7.19	7.74	8.47	9.40	10.77	13.52	18.06	24.94	35.59
Ordinary Endowment Ins.									
Payable at Death or in 5 years..	175.47	175.68	175.98	176.36	176.85	177.80	179.55	182.24	186.43
" " 10 " ..	79.57	79.86	80.26	80.76	81.51	82.97	85.46	89.32	95.43
" " 15 " ..	48.51	48.87	49.35	50.00	51.07	53.04	56.26	61.30	
" " 20 " ..	33.66	34.08	34.66	35.53	36.97	39.49	43.54		
" " 25 " ..	25.27	25.77	26.51	27.64	29.50	32.62			
" " 30 " ..	20.11	20.73	21.66	23.09	25.39				
Ten-Payment Endowment Insurance.									
Payable at Death or in 15 years..	64.18	64.57	65.08	65.76	66.82	68.81	72.08	77.07	
" " 20 " ..	52.67	53.18	53.87	54.86	56.44	59.20	63.56		
" " 25 " ..	44.09	44.77	45.73	47.15	49.39	53.09			
" " 30 " ..	37.76	38.66	39.98	41.93	44.91				
Temporary Ins. & Deferred Annuity.									
Insurance, \$1,000. Annuity, \$100.									
Premiums { Term of 10 yrs.	122.17	117.53	111.98	105.32	97.81	90.34	83.72	79.08	78.46
ceasing at { " " 20 "	45.11	42.90	40.47	38.13	36.37	36.08	38.20		
the end of { " " 30 "	22.82	21.93	21.38	21.56	23.07				
Simple Endowments.									
Annual Premium for \$1,000.									
Payable only if alive after 10 yrs.	72.24	71.94	71.56	71.04	70.06	68.36	65.78	61.93	56.23
" " " 20 "	25.83	25.51	24.98	24.09	22.69	20.62	17.71		
" " " 30 "	11.68	11.17	10.40	9.26	7.70				
Single Premium.									
Payable only if alive after 10 yrs.	568.00	564.34	559.57	553.36	542.60	523.47	494.31	452.24	393.06
" " " 20 "	317.83	312.28	303.62	289.67	268.21	236.73	194.29		
" " " 30 "	172.46	163.47	150.08	131.00	105.42				

From the Single Premiums for Simple Endowments, given on this and the next page, agents can form an idea of what a company must charge for a policy of \$1,000, payable only if the person attains a certain age.

The most intelligent agents often think a fine investment can be made on this plan, and are much surprised when they find how large the premium is. Let us take the case of a man aged 40, wishing \$1,000, ten years hence, nothing to be paid at prior death; the net 5 per cent. rate is \$542.60; adding only 7½ per cent. for expenses and commissions, makes it \$583.74; but

## SKELETON TABLE

OF

## Net Premiums for All Forms of Insurance,

ACCORDING TO THE ACTUARIES' TABLE, AT 6 PER CENT.

Form of Insurance.	Net Premium at Ages.								
	20	25	30	35	40	45	50	55	60
<b>Whole Life Insurance.</b>									
Ordinary Annual.....	10.54	12.00	13.93	16.49	19.97	24.84	31.51	40.53	52.86
Twenty Payments.....	13.69	15.34	17.44	20.12	23.63	28.42	34.80	43.26	54.82
Fifteen ".....	15.95	17.85	20.24	23.27	27.18	32.40	39.17	47.84	59.27
Ten ".....	20.73	23.17	26.23	30.08	34.96	41.34	49.38	59.25	71.56
Five ".....	35.64	39.77	44.96	51.43	59.58	69.97	82.68	97.60	114.99
Single ".....	156.93	174.97	197.51	225.59	260.75	304.97	357.59	417.24	482.89
<b>Short Term Insurance.</b>									
Seven Years.....	7.12	7.66	8.38	9.31	10.66	13.36	17.85	24.64	35.16
<b>Ordinary Endowment Ins.</b>									
Payable at Death or in 5 years..	170.49	170.71	171.00	171.39	171.88	172.84	174.60	177.31	181.53
" " 10 " ..	75.50	75.80	76.20	76.71	77.46	78.95	81.48	85.39	91.59
" " 15 " ..	45.03	45.39	45.88	46.55	47.63	49.64	52.93	58.05	
" " 20 " ..	30.66	31.09	31.69	32.57	34.03	36.59	40.71		
" " 25 " ..	22.69	23.21	23.96	25.11	26.98	30.13			
" " 30 " ..	17.90	18.53	19.47	20.91	23.20				
<b>Ten-Payment Endowment Insurance.</b>									
Payable at Death or in 15 years..	58.53	58.92	59.45	60.16	61.27	63.34	66.73	71.89	
" " 20 " ..	46.41	46.94	47.66	48.69	50.34	53.23	57.77		
" " 25 " ..	37.80	38.50	39.49	40.96	43.27	47.09			
" " 30 " ..	31.74	32.66	33.99	35.96	38.98				
<b>Temporary Ins. &amp; Deferred Annuity.</b>									
<i>Insurance, \$1,000. Annuity, \$100.</i>									
Premiums ceasing at the end of the term. { Term of 10 yrs.	104.01	100.81	96.88	92.00	86.39	80.86	76.12	73.18	73.99
" " " " { " " 20 "	37.68	36.25	34.69	33.20	32.30	32.77	35.52		
" " " " { " " 30 "	19.21	18.81	18.73	19.31	21.10				
<b>Simple Endowments.</b>									
<i>Annual Premium for \$1,000.</i>									
Payable only if alive after 10 yrs.	68.25	67.96	67.59	67.10	66.17	64.54	62.08	58.41	53.98
" " " 20 "	22.94	22.66	22.18	21.37	20.11	18.25	15.64		
" " " 30 "	9.67	9.24	8.59	7.64	6.33				
<i>Single Premium.</i>									
Payable only if alive after 10 yrs.	516.63	513.31	508.96	503.31	493.53	476.13	449.60	411.34	357.52
" " " 20 "	262.95	258.35	251.19	239.64	221.89	195.85	160.74		
" " " 30 "	129.77	123.01	112.94	98.57	79.33				

this sum, compounded semi-annually at 6 per cent. in a savings bank, would yield over \$1,050 in the same time, without any risk of loss by prior death, which risk would offset the probable dividends that the company might make, if it realizes the same rate of interest.

The reason why this would be such a poor investment is, that the rate of mortality at ages from 40 to 50 is so small that out of a hundred such cases the gain from those that do not survive will only be about enough to pay the expenses and commissions on all.

## Explanation of Valuation Tables.

---

The “*value*” of a policy is the difference between the present value of the sum insured, and the present value of the future payments to be made to secure it. In calculating the *net value* it is assumed that only the net premium (according to the particular Mortality Table employed) will be received, the excess of the actual over the net premium being allowed for expenses, etc.

Thus, according to the Actuaries’ Table, at 4 per cent., the *net value* of a policy for \$1,000 issued at the age of 40 and now at the end of its fifth year, is equal to the present value of \$1,000 payable at the death of a person now aged 45, less the present value of the future net premiums according to that Table.

From page 21 we find the present value of \$1,000 payable at the death of a person aged 45, to be.....\$428.57

To find the value of the future net premiums, we take the net premium at age 40—\$23.68—and multiply it by the value of a 4 per cent. annuity, at the age 45 (page 20), increased by \$1.00 (because a premium is due immediately, and annuities in general do not begin till the end of the year), which is \$14.857, and the product is..... 351.81

Difference or net value..... 76.76

(Which is within a few cents of the more exactly calculated amount in the tables.)

The following pages give the net values of, or reserves for, policies at the end of various years from 1 to 20, according to the Actuaries’ Table at 4 per cent.

Where the value at the end of a certain year is not stated, it can always be estimated with sufficient practical exactness from what is given. Thus, for the value at the end of the 13th year take three-fifths of the difference between that at the end of the 10th and 15th, and add it to the former.

To find the value at the end of, say  $4\frac{1}{2}$  years, *when the policy has been paid semi-annually or quarterly* to that time—take the mean between the value at the end of 4 and 5 years—*when, however, the policy has been paid annually to the end of its year*, there must be added to the previous results, the net premium for the balance of the policy year. Thus, in calculating the value at the end of  $4\frac{1}{4}$  years, three-fourths of the net annual premium must be added.

The values of ENDOWMENTS at 60, 50 and 40 only are given, it being neither necessary nor practicable to give them for all the different forms that are now issued.

N. B.—The values of Endowments depend more on the term to run, than on the age at issue: thus, the values at the end of five years of an ORDINARY ENDOWMENT at 40, issued at age 25 (\$259.49), and of one issued at age 35, payable at 50 (\$257.94), are nearly the same, both having 15 years to run from issue, *and in this case the value of that on the older life is actually the less.* So, as tables for all the different old and new forms of Endowments would require too much space, it was decided only to give what is necessary for a close practical estimate.

To find the value of an Endowment payable at any other age, take the nearest case given in the tables, of a policy with the same time to run from issue: thus—

When payable at any age above 55, take the "Endowment at 60" table.

“	“	“	from 45 to 55	“	“ 50”	“
“	“	“	below 45	“	“ 40”	“

and follow the directions under them.

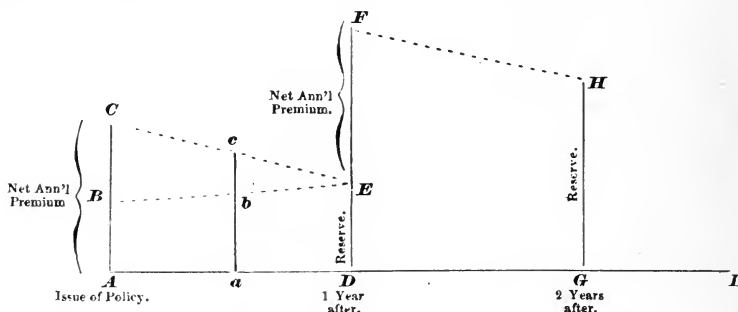
To estimate more exactly, take the difference between the values of two policies for a similar term, payable at an older and a younger age, and add a proportionate part to the lesser value—

Thus, for the value of a policy issued at age 32, payable in twenty years, on which two annual payments have been made: Take

Value (end of second year) of a policy issued at age 40, payable in twenty years (age 60):.....	\$54.96
Value (end of second year) of a policy issued at age 30, payable in twenty years (age 50):.....	64.00
Difference.....	0.96

Adding two-tenths of this difference to the lesser, we have \$64.19, which is probably very nearly the exact value.

**The Relations between Premiums and Reserves** are very clearly illustrated by the following diagram, in which the dollars of premium and reserve are represented by vertical lines placed at intervals along the line A I, representing the time the policy has been in force:



A C is the net annual premium paid at the issue of the policy, and is composed of two parts, viz.: B C, which provides for the insurance during the first year; and A B, the part to be laid by against the time when the annual premium will be insufficient to meet the risk. At the issue of the policy, the company must hold the entire net premium A C in reserve; as the year passes away, the portion B C is used up in giving the temporary insurance, which it is intended to cover, and about the middle of the year, the reserve required is only  $a c$ , as  $b c$  is sufficient to cover the risk for the remaining six months; at the end of the year the reserve required is only D E (equal to A B with a year's interest), but the moment the second annual premium is paid, the reserve is increased by the amount of the net premium, and becomes D F.

A portion of the second annual premium is used in paying the claims under other policies during the year, and the balance goes into the reserve fund, which, with interest, becomes G H at the end of the second year.

During succeeding years the reserve fluctuates in a similar manner, but when the fund becomes so large that the interest thereon exceeds the cost of insurance, it does not decrease during the year, as represented in the above diagram.

In the case of an ordinary life policy for \$1,000, issued at the age of 35, A C = \$19.87, - B C and A B are respectively \$8.83 and \$11.04. D E = \$11.48, D F = \$31.35, and G H = \$23.34.

It is clear that as the reserve *increases* the amount at risk *decreases*; thus, at the end of the first year, the reserve fund in the last case is \$11.48, and in case of death the company would have to furnish \$988.52 from the payments of other members; but when the reserve has increased to \$600, the company would have to make up only \$400 additional in case of death. In this connection it must be remembered that theoretically losses are not payable until the end of the policy-year, as stated on page 23.



## Surrender Values.

---

The amounts given as the *net values* of policies must not be taken as their *surrender values*, or what a Company could or should give in purchase—which must be decided according to the circumstances of each case, as the health of the insured, the form of the policy, etc.

When the insured is in extremely bad health, it is the interest of the Company to pay more than the *net value*; but where the health is fair, the Company must guard itself against the possible departure of the more sound lives, by taking off from the *net* a margin, greater or less, according to the term the policy has yet to run: thus a larger percentage should be deducted in the case of a Life policy, than in that of an Endowment, with only three or four years more to run.

Those Companies that have made their reserves and dividends on a more favorable rate of interest than four per cent. cannot of course be expected to allow as large a surrender value as those that have not, since the former have thereby been able to give larger dividends than they could have done had they made their reserves as large as those of the other Companies. This applies to nearly all Companies having very low rates.

There is another method of calculating the proper sum to be paid, which will, in the case of some Companies, give more equitable results:—it is to credit the insured with his actual payments, and interest thereon, and charge him with the actual cost of the insurance enjoyed by him, with an allowance for expenses, and for the safety of those remaining.

Those who surrender their policies and withdraw their funds from the mutual risk of excessive mortality or financial revulsion, must remember that the safety of those that remain, requires that the claims of retiring members shall not be bought at too large an estimate.

On the other hand, it seems just as much the interest of a Company to have a good reputation for liberal dealing with retiring members, as for paying claims without unjustifiable delay or litigation, for it is not altogether playing upon words to say that a *living* man will resent an injustice more than a *dead* one.

It is not intended to state here, however, what surrender values should be given, but merely to inform the public of certain general and important facts, trusting that in time a better understanding of what is both right and expedient will keep policy-holders from expecting too much, and Companies from offering too little.

## ORDINARY LIFE.

Net Value of a Policy of \$1,000 at the end of various years.

<i>Age at Issue.</i>	<i>1 Year.</i>	<i>2 Years.</i>	<i>3 Years.</i>	<i>4 Years.</i>	<i>5 Years.</i>	<i>6 Years.</i>
20	6.22	12.66	19.32	26.19	33.30	40.64
21	6.48	13.17	20.09	27.24	34.64	42.27
22	6.74	13.71	20.90	28.34	36.03	43.97
23	7.01	14.26	21.75	29.49	37.48	45.74
24	7.30	14.84	22.64	30.69	39.00	47.59
25	7.60	15.45	23.56	31.94	40.59	49.51
26	7.91	16.08	24.52	33.24	42.23	51.52
27	8.24	16.75	25.53	34.60	43.96	53.62
28	8.58	17.44	26.58	36.02	45.76	55.81
29	8.94	18.16	27.68	37.50	47.64	58.12
30	9.31	18.91	28.82	39.06	49.63	60.54
31	9.70	19.70	30.03	40.70	51.71	63.09
32	10.10	20.53	31.31	42.43	53.91	65.78
33	10.54	21.42	32.65	44.26	56.25	68.63
34	11.00	22.35	34.08	46.20	58.71	71.65
35	11.48	23.34	35.59	48.25	61.33	74.86
36	12.00	24.39	37.19	50.43	64.11	78.26
37	12.55	25.50	38.90	52.75	67.07	81.86
38	13.12	26.69	40.72	55.22	70.20	85.62
39	13.74	27.96	42.65	57.83	73.46	89.48
40	14.41	29.31	44.70	60.55	76.79	93.42
41	15.12	30.73	46.81	63.29	80.16	97.35
42	15.86	32.18	48.91	66.04	83.49	101.26
43	16.59	33.59	51.00	68.73	86.78	105.14
44	17.30	34.99	53.02	71.38	90.05	109.02
45	18.01	36.36	55.04	74.04	93.34	112.94
46	18.69	37.71	57.06	76.72	96.67	116.90
47	19.39	39.10	59.14	79.47	100.08	120.95
48	20.11	40.54	61.27	82.29	103.57	125.09
49	20.85	42.01	63.46	85.18	107.14	129.33
50	21.61	43.52	65.70	88.13	110.79	133.66
51	22.39	45.06	67.98	91.15	114.53	138.09
52	23.19	46.63	70.33	94.25	118.35	142.64
53	24.00	48.26	72.74	97.41	122.29	147.31
54	24.86	49.94	75.22	100.70	126.35	152.12
55	25.72	51.64	77.78	104.07	130.50	156.97
56	26.61	53.43	80.42	107.55	134.72	161.90
57	27.56	55.29	83.15	111.07	138.99	166.84
58	28.52	57.17	85.88	114.59	143.23	171.77
59	29.50	59.05	88.60	118.08	147.46	176.66
60	30.45	60.90	91.28	121.55	151.63	181.47

To find the value by a 5 per cent. Table, deduct about 12 per cent. from the above; for the same by a 4½ per cent. Table, deduct about 6 per cent., and the balance will be tolerably correct for the middle ages of the above Table.

## ORDINARY LIFE.

(Continued.)

<i>Age at Issue.</i>	<i>7 Years.</i>	<i>8 Years.</i>	<i>9 Years.</i>	<i>10 Years.</i>	<i>15 Years.</i>	<i>20 Years.</i>
20	48.23	56.07	64.17	72.53	118.56	172.62
21	50.16	58.31	66.72	75.41	123.22	179.43
22	52.17	60.64	69.38	78.41	128.09	186.57
23	54.26	63.06	72.15	81.53	133.19	194.03
24	56.45	65.60	75.04	84.79	138.52	201.80
25	58.73	68.24	78.06	88.20	144.12	209.84
26	61.10	71.00	81.22	91.76	149.99	218.13
27	63.59	73.89	84.52	95.50	156.17	226.62
28	66.20	76.92	87.99	99.43	162.65	235.31
29	68.93	80.10	91.64	103.56	169.41	244.21
30	71.81	83.45	95.48	107.91	176.42	253.29
31	74.84	86.98	99.53	112.51	183.65	262.57
32	78.04	90.71	103.82	117.37	191.06	272.02
33	81.43	94.67	108.36	122.50	198.65	281.65
34	85.03	98.86	113.15	127.86	206.40	291.42
35	88.84	103.29	118.16	133.41	214.30	301.35
36	92.87	107.92	123.35	139.13	222.35	311.42
37	97.09	112.70	128.68	144.96	230.54	321.60
38	101.43	117.61	134.10	150.89	238.83	331.91
39	105.88	122.58	139.59	156.89	247.22	342.33
40	110.36	127.60	145.14	162.97	255.71	352.84
41	114.85	132.64	150.73	169.08	264.25	363.37
42	119.33	137.69	156.33	175.22	272.83	373.90
43	123.80	142.74	161.93	181.37	281.47	384.39
44	128.28	147.80	167.56	187.54	290.19	394.86
45	132.80	152.91	173.24	193.80	299.01	405.30
46	137.38	158.08	179.01	200.13	307.89	415.70
47	142.05	163.38	184.90	206.59	316.86	426.07
48	146.84	168.72	190.90	213.19	325.89	436.37
49	151.73	174.30	197.05	219.95	334.97	446.61
50	156.72	179.95	203.34	226.84	344.07	456.79
51	161.84	185.74	209.76	233.82	353.17	466.88
52	167.09	191.66	216.27	240.88	362.24	476.87
53	172.47	197.66	222.86	248.00	371.25	486.76
54	177.93	203.75	229.51	255.17	380.21	496.55
55	183.45	209.87	236.19	262.35	389.11	506.20
56	189.01	216.02	242.87	269.50	397.92	515.74
57	194.59	222.17	249.54	276.63	406.65	525.16
58	200.14	228.27	256.13	283.65	415.26	534.43
59	205.62	234.30	262.63	290.58	423.74	543.52
60	211.02	240.21	269.02	297.42	432.09	552.40

## ORDINARY ENDOWMENT AT 60.

Net Value of a \$1,000 Policy at the end of various years.

<i>Age at Issue.</i>	<i>1 Year.</i>	<i>2 Years.</i>	<i>3 Years.</i>	<i>4 Years.</i>	<i>5 Years.</i>	<i>6 Years.</i>
20	10.09	20.57	31.47	42.79	54.56	66.80
21	10.59	21.60	33.04	44.93	57.29	70.13
22	11.13	22.69	34.71	47.20	60.18	73.68
23	11.69	23.84	36.48	49.61	63.26	77.45
24	12.30	25.08	38.36	52.18	66.53	81.46
25	12.94	26.39	40.38	54.91	70.03	85.74
26	13.63	27.80	42.52	57.83	73.75	90.30
27	14.36	29.29	44.82	60.95	77.73	95.18
28	15.15	30.90	47.27	64.29	82.00	100.42
29	15.99	32.62	49.90	67.88	86.58	106.05
30	16.89	34.46	52.73	71.74	91.52	112.11
31	17.87	36.45	55.79	75.91	96.85	118.66
32	18.92	38.61	59.09	80.42	102.63	125.77
33	20.06	40.95	62.69	85.32	108.91	133.48
34	21.31	43.49	66.59	90.66	115.74	141.89
35	22.67	46.27	70.86	96.49	123.20	151.08
36	24.15	49.31	75.53	102.87	131.39	161.15
37	25.79	52.65	80.67	109.89	140.39	172.21
38	27.58	56.34	86.34	117.64	150.30	184.35
39	29.57	60.42	92.61	126.20	161.22	197.68
40	31.79	64.96	99.57	135.66	173.23	212.37
41	34.26	70.01	107.28	146.09	186.51	228.57
42	37.02	75.60	115.79	157.65	201.20	246.58
43	40.07	81.80	125.27	170.50	217.61	266.73
44	43.48	88.75	135.87	184.96	236.13	289.53
45	47.33	96.60	147.91	201.41	257.24	315.59
46	51.71	105.57	161.73	220.34	281.59	345.68
47	56.80	116.02	177.82	242.41	310.00	380.83
48	62.78	128.31	196.79	268.44	343.55	422.41
49	69.92	142.98	219.44	299.57	383.72	472.27
50	78.56	160.76	246.92	337.39	432.60	533.03

**N. B.**—For the Value of an Endowment, payable at any age from 55 upwards.

Take a case from the above table with the same time to run from issue, and its value will, in practice, be that required.

**EXAMPLE.**

A policy for \$1,000, issued at age 47, *with 15 years to run*, has been in force two years. What is its value?

Deducting 15 from 60 we find that a policy issued at the age of 45 in the table would correspond to the example as regards the term to run, and its value after two years, \$96.60, is the required amount.

## ORDINARY ENDOWMENT AT 60.

(Continued.)

<i>Age at Issue.</i>	<i>7 Years.</i>	<i>8 Years.</i>	<i>9 Years.</i>	<i>10 Years.</i>	<i>15 Years.</i>	<i>20 Years.</i>
20	79.52	92.74	106.48	120.77	201.24	299.65
21	83.49	97.37	111.81	126.81	211.38	315.00
22	87.71	102.30	117.47	133.24	222.19	331.39
23	92.20	107.54	123.48	140.07	233.72	348.89
24	96.98	113.12	129.90	147.36	246.04	367.59
25	102.08	119.07	136.74	155.14	259.23	387.56
26	107.51	125.42	144.06	163.46	273.37	408.89
27	113.34	132.23	151.90	172.38	288.57	431.72
28	119.59	139.54	160.32	181.97	304.92	456.18
29	126.31	147.41	169.39	192.30	322.52	482.49
30	133.55	155.89	179.18	203.45	341.44	510.85
31	141.39	165.07	189.76	215.52	361.83	541.53
32	149.88	175.02	201.24	228.61	383.82	574.83
33	159.11	185.84	213.73	242.84	407.61	611.12
34	169.17	197.63	227.34	258.30	433.43	650.83
35	180.16	210.51	242.15	275.09	461.57	694.49
36	192.20	224.57	258.28	293.39	492.36	742.74
37	205.38	239.93	275.90	313.35	526.21	796.34
38	219.81	256.74	295.17	335.21	563.60	856.25
39	235.66	275.18	316.35	359.27	605.13	923.65
40	253.09	295.52	339.75	385.91	651.57	1,000.00
41	272.39	318.07	365.75	415.57	703.82	
42	293.88	343.25	394.84	448.83	763.08	
43	318.00	371.58	427.64	486.40	830.83	
44	345.35	403.75	464.96	529.24	908.98	
45	376.65	440.64	507.84	578.56	1,000.00	
46	412.85	483.39	557.62	635.92		
47	455.21	533.50	616.07	703.40		
48	505.40	592.95	685.54	783.77		
49	565.68	664.47	769.29	880.84		
50	639.25	751.94	871.88	1,000.00		

For further explanation see page 27.

To estimate the value by any table at 5 per cent., deduct six per cent. from the above value in any case where the policy has about 15 years to run, and 10 per cent. where about 25 years to run.

For the same by a  $4\frac{1}{2}$  per cent. table, deduct one-half these per centages.

## ORDINARY ENDOWMENT AT 50.

Net Value of a Policy for \$1,000 at the end of various years.

<i>Age at Issue.</i>	<i>1 Year.</i>	<i>2 Years.</i>	<i>3 Years.</i>	<i>4 Years.</i>	<i>5 Years.</i>	<i>6 Years.</i>
20	16.42	33.54	51.39	70.00	89.41	109.65
21	17.40	35.55	54.47	74.21	94.79	116.26
22	18.47	37.73	57.81	78.76	100.61	123.42
23	19.62	40.08	61.42	83.69	106.92	131.16
24	20.87	42.64	65.35	89.05	113.77	139.58
25	22.24	45.43	69.63	94.88	121.24	148.75
26	23.72	48.47	74.30	101.26	129.39	158.77
27	25.35	51.81	79.42	108.24	138.33	169.76
28	27.14	55.47	85.04	115.92	148.17	181.85
29	29.12	59.52	91.25	124.40	159.03	195.22
30	31.31	64.00	98.14	133.81	171.09	210.06
31	33.75	68.99	105.81	144.30	184.53	226.61
32	36.47	74.58	114.41	156.05	199.60	245.18
33	39.55	80.89	124.10	169.30	216.60	266.11
34	43.04	88.04	135.10	184.34	235.89	289.88
35	47.02	96.20	147.66	201.53	257.94	317.05
36	51.61	105.61	162.13	221.33	283.35	348.37
37	56.94	116.54	178.96	244.36	312.92	384.80
38	63.20	129.38	198.74	271.43	347.66	427.61
39	70.65	144.68	222.28	303.65	388.99	478.52
40	79.66	163.16	250.72	342.54	438.87	540.00

N. B.—For the Value of an Endowment, payable at any age from 45 to 55, take a case from the above table with the same term to run from issue, and its value will be practically that required.

## ORDINARY ENDOWMENT AT 40.

Net Value of a Policy for \$1,000 at the end of various years.

<i>Age at Issue.</i>	<i>1 Year.</i>	<i>2 Years.</i>	<i>3 Years.</i>	<i>4 Years.</i>	<i>5 Years.</i>	<i>6 Years.</i>
20	31.39	64.19	98.48	134.33	171.80	210.99
21	33.87	69.27	106.27	144.96	185.42	227.74
22	36.64	74.94	114.99	156.87	200.67	246.50
23	39.76	81.33	124.80	170.27	217.84	267.62
24	43.29	88.56	135.92	185.46	237.29	291.54
25	47.32	96.82	148.60	202.78	259.49	318.85
26	51.95	106.31	163.18	222.70	285.02	350.27
27	57.33	117.32	180.11	245.84	314.67	386.77
28	63.64	130.24	199.97	272.99	349.48	429.63
29	71.13	145.60	223.58	305.27	390.86	480.59
30	80.17	164.12	252.06	344.21	440.82	542.11

N. B.—For the Value of an Endowment, payable at any age below 45, use the above table as just explained for the last table above, and for any further explanation, see pages 27 and 32.

## ORDINARY ENDOWMENT AT 50.

(Continued.)

<i>Age at Issue.</i>	<i>7 Years.</i>	<i>8 Years.</i>	<i>9 Years.</i>	<i>10 Years.</i>	<i>15 Years.</i>	<i>20 Years.</i>
20	130.77	152.81	175.81	199.81	336.71	507.80
21	138.67	162.05	186.45	211.92	357.35	539.44
22	147.21	172.04	197.96	225.03	379.71	573.81
23	156.46	182.87	210.45	239.24	404.02	611.22
24	166.52	194.65	224.02	254.71	430.52	652.04
25	177.48	207.48	238.82	271.59	459.47	696.69
26	189.46	221.51	255.02	290.05	491.22	745.70
27	202.60	236.92	272.80	310.32	526.13	799.69
28	217.07	253.88	292.38	332.67	564.68	859.42
29	233.06	272.64	314.06	357.41	607.37	925.81
30	250.83	293.48	338.13	384.90	654.85	1,000.00
31	270.65	316.74	365.01	415.60	707.91	
32	292.88	342.84	395.19	450.06	767.53	
33	317.96	372.29	429.24	488.96	834.97	
34	346.44	405.74	467.91	533.12	911.79	
35	379.01	443.98	512.12	583.61	1,000.00	
36	416.55	488.05	563.06	641.81		
37	460.20	539.29	622.32	709.56		
38	511.47	599.52	692.03	789.34		
39	572.50	671.25	775.12	884.55		
40	646.26	758.03	875.77	1,000.00		

Thus, for the Value of a Policy issued at age 25, with 20 years to run, take that of one issued at age 30 from the above table. To find the value at a different rate of interest, see last page but one.

## ORDINARY ENDOWMENT AT 40.

(Continued.)

<i>Age at Issue.</i>	<i>7 Years.</i>	<i>8 Years.</i>	<i>9 Years.</i>	<i>10 Years.</i>	<i>15 Years.</i>	<i>20 Years.</i>
20	251.98	294.87	339.74	386.71	657.06	1,000.00
21	272.02	318.34	366.83	417.59	710.08	
22	294.45	344.64	397.18	452.20	769.56	
23	319.71	374.25	431.36	491.19	836.67	
24	348.34	407.82	470.12	535.40	912.86	
25	381.02	446.14	514.38	585.92	1,000.00	
26	418.63	490.26	565.35	644.09		
27	462.33	541.53	624.58	711.71		
28	513.64	601.75	694.18	791.18		
29	574.68	673.39	776.98	885.75		
30	648.38	759.91	877.00	1,000.00		

## TEN-PAYMENT LIFE.

Net Value of a Policy of \$1,000 at the end of various years.

<i>Age at Issue.</i>	<i>1 Year.</i>	<i>2 Years.</i>	<i>3 Years.</i>	<i>4 Years.</i>	<i>5 Years.</i>
20	24.94	50.98	78.19	106.60	136.29
21	25.46	52.06	79.83	108.85	139.17
22	26.01	53.17	81.53	111.17	142.13
23	26.57	54.31	83.29	113.56	145.19
24	27.14	55.49	85.10	116.03	148.34
25	27.75	56.71	86.97	118.57	151.60
26	28.36	57.97	88.89	121.20	154.94
27	28.99	59.26	90.87	123.89	158.40
28	29.64	60.59	92.91	126.67	161.95
29	30.31	61.96	95.01	129.54	165.61
30	31.00	63.37	97.17	132.49	169.40
31	31.71	64.82	99.40	135.53	173.30
32	32.44	66.32	101.70	138.67	177.32
33	33.20	67.86	104.08	141.92	181.49
34	33.98	69.46	106.53	145.28	185.79
35	34.78	71.11	109.07	148.74	190.23
36	35.61	72.82	111.69	152.33	194.84
37	36.48	74.58	114.41	156.05	199.61
38	37.37	76.41	117.23	159.91	204.54
39	38.30	78.32	120.16	163.90	209.61
40	39.27	80.31	123.20	168.00	214.76
41	40.28	82.36	126.30	172.13	219.96
42	41.32	84.43	129.39	176.27	225.14
43	42.35	86.48	132.46	180.36	230.29
44	43.35	88.49	135.47	184.40	235.41
45	44.34	90.45	138.44	188.41	240.53
46	45.29	92.37	141.37	192.40	245.62
47	46.24	94.30	144.31	196.40	250.72
48	47.18	96.22	147.24	200.38	255.80
49	48.12	98.13	150.15	204.33	260.85
50	49.06	100.02	153.03	208.25	265.88
51	49.97	101.88	155.87	212.12	270.84
52	50.87	103.71	158.67	215.94	275.74
53	51.75	105.51	161.43	219.69	280.59
54	52.64	107.29	164.13	223.41	285.37
55	53.48	109.00	166.79	227.05	290.06
56	54.31	110.71	169.40	230.62	294.62
57	55.14	112.39	171.95	234.06	299.02
58	55.94	114.00	174.37	237.32	303.19
59	56.71	115.51	176.63	240.38	307.13
60	57.40	116.88	178.70	243.20	310.78



## TEN-PAYMENT LIFE.

(Continued.)

Age at Issue.	6 Years.	7 Years.	8 Years.	9 Years.	10 Years.
20	167.32	199.75	233.66	269.10	306.17
21	170.85	203.96	238.58	274.77	312.62
22	174.49	208.30	243.66	280.62	319.29
23	178.24	212.79	248.90	286.67	326.17
24	182.11	217.40	254.31	292.90	333.27
25	186.10	222.17	259.88	299.33	340.60
26	190.21	227.08	265.64	305.97	348.17
27	194.45	232.15	271.57	312.82	355.99
28	198.82	237.37	277.70	319.89	364.07
29	203.33	242.77	284.02	327.21	372.42
30	207.98	248.33	290.56	334.76	381.04
31	212.78	254.09	297.31	342.56	389.96
32	217.74	260.03	304.28	350.63	399.18
33	222.87	266.17	311.50	358.97	408.71
34	228.16	272.52	318.96	367.59	418.52
35	233.64	279.08	326.66	376.45	428.57
36	239.32	285.87	334.58	385.53	438.86
37	245.18	292.85	342.68	394.81	449.35
38	251.21	299.97	350.95	404.25	460.02
39	257.35	307.23	359.34	413.83	470.88
40	263.59	314.56	367.82	423.54	481.91
41	269.85	321.94	376.40	433.39	493.11
42	276.12	329.37	385.04	443.34	504.46
43	282.39	336.82	393.74	453.38	515.95
44	288.65	344.28	402.49	463.51	527.57
45	294.92	351.78	411.29	473.71	539.31
46	301.18	359.27	420.11	483.98	551.16
47	307.45	366.78	428.97	494.31	563.10
48	313.69	374.30	437.85	504.68	575.14
49	319.93	381.79	446.73	515.09	587.26
50	326.12	389.25	455.60	525.52	599.43
51	332.26	396.69	464.45	535.95	611.63
52	338.35	404.06	473.26	546.33	623.83
53	344.37	411.38	481.98	556.65	636.00
54	350.32	418.57	490.59	566.88	648.12
55	356.12	425.62	499.04	576.98	660.17
56	361.77	432.49	507.20	586.92	672.13
57	367.22	439.14	515.39	596.68	683.96
58	372.43	445.54	523.19	606.22	695.66
59	377.35	451.63	530.71	615.50	707.19
60	381.96	457.39	537.09	624.51	718.57

For the approximate value by a 5 per cent. table, deduct 20 per cent., and for that by a 4½ per cent. table, deduct 10 per cent., and the result will be quite correct at the middle ages.

**TEN-PAYMENT ENDOWMENT AT 60.**  
**Net Value of a \$1,000 Policy at the end of various years.**

<i>Age at Issue.</i>	<i>1 Year.</i>	<i>2 Years</i>	<i>3 Years.</i>	<i>4 Years.</i>	<i>5 Years.</i>
20	31.36	64.13	98.38	134.18	171.61
21	32.20	65.84	101.01	137.77	176.19
22	33.06	67.61	103.72	141.47	180.96
23	33.96	69.45	106.55	145.35	185.91
24	34.90	71.38	109.50	149.36	191.04
25	35.88	73.36	112.56	153.53	196.39
26	36.89	75.44	115.73	157.87	201.94
27	37.93	77.57	119.02	162.38	207.70
28	39.02	79.81	122.45	167.06	213.71
29	40.16	82.13	126.02	171.92	219.94
30	41.33	84.54	129.72	176.98	226.44
31	42.56	87.05	133.58	182.26	233.21
32	43.83	89.66	137.60	187.77	240.26
33	45.16	92.39	141.80	193.48	247.61
34	46.54	95.22	146.15	199.47	255.28
35	47.99	98.19	150.70	205.69	263.29
36	49.49	101.27	155.45	212.20	271.63
37	51.07	104.49	160.42	219.01	280.39
38	52.70	107.86	165.64	226.13	289.55
39	54.44	111.42	171.10	233.61	299.10
40	56.27	115.15	176.83	241.40	309.02
41	58.17	119.06	182.78	249.47	319.31
42	60.16	123.09	188.92	257.82	329.94
43	62.20	127.24	195.27	266.42	340.93
44	64.31	131.52	201.78	275.31	352.34
45	66.48	135.91	208.53	284.53	364.21
46	68.67	140.43	215.50	294.13	376.59
47	70.99	145.18	222.81	304.18	389.56
48	73.39	150.13	230.46	314.70	403.17
49	75.91	155.30	238.47	325.75	417.49
50	78.56	160.76	246.92	337.39	432.60

The above table may be used for any ten-payment Endowment payable at 55 or upwards, by taking therefrom a case with the same term to run from issue; thus for the value of a ten-payment Endowment at 65, issued at age 40, two years ago, take the above for age 35 at end of the second year, as this, like the Example, has 25 years to run. See page 27.

For the value by a 5 per cent. table, deduct about 7 per cent. on policies with 15 years yet to run, and about 15 per cent. on those with 25 years yet to run.

## TEN-PAYMENT ENDOWMENT AT 60.

(Continued.)

<i>Age at Issue.</i>	<i>6 Years.</i>	<i>7 Years.</i>	<i>8 Years.</i>	<i>9 Years.</i>	<i>10 Years.</i>
20	210.76	251.71	294.54	339.36	386.28
21	216.39	258.44	302.43	348.46	396.65
22	222.24	265.43	310.62	357.92	407.43
23	228.32	272.70	319.14	367.75	418.64
24	234.65	280.26	328.00	377.97	430.31
25	241.21	288.12	337.21	388.61	442.45
26	248.04	296.29	346.79	399.68	455.08
27	255.14	304.78	356.76	411.20	468.24
28	262.52	313.62	367.14	423.20	481.95
29	270.21	322.83	377.95	435.70	496.24
30	278.21	332.42	389.21	448.73	511.14
31	286.55	342.41	400.95	462.32	526.68
32	295.23	352.83	413.19	476.49	542.90
33	304.30	363.70	425.97	491.29	559.82
34	313.75	375.04	439.31	506.71	577.46
35	323.62	386.89	453.23	522.82	595.83
36	333.94	399.26	467.75	539.58	614.96
37	344.73	412.16	482.85	557.02	634.87
38	355.97	425.59	498.58	575.17	655.61
39	367.67	439.55	514.93	594.05	677.23
40	379.84	454.06	531.93	613.73	699.80
41	392.43	469.13	549.61	634.26	723.38
42	405.49	484.77	568.06	655.69	748.06
43	419.05	501.07	587.27	678.10	773.92
44	433.15	518.04	607.37	701.56	801.08
45	447.84	535.80	628.42	726.20	829.66
46	463.21	554.37	650.51	752.13	859.81
47	479.34	573.90	673.79	779.48	891.70
48	496.28	594.50	698.33	808.43	925.53
49	514.15	616.24	724.34	839.16	961.54
50	533.02	639.25	751.94	871.88	1,000.00

The value at the end of the tenth and any succeeding year is the same as the single premium at the then present age. See page 21.

**TEN-PAYMENT ENDOWMENT AT 50.**  
**Net Value of a \$1,000 Policy at the end of various years.**

<i>Age at Issue.</i>	<i>1 Year.</i>	<i>2 Years.</i>	<i>3 Years.</i>	<i>4 Years.</i>	<i>5 Years.</i>
20	40.20	82.23	126.19	172.17	220.27
21	41.46	84.81	130.15	177.57	227.21
22	42.78	87.51	134.29	183.23	234.45
23	44.15	90.32	138.61	189.14	242.01
24	45.58	93.25	143.12	195.28	249.87
25	47.07	96.31	147.81	201.69	258.10
26	48.63	99.49	152.71	208.40	266.69
27	50.26	102.83	157.84	215.40	275.67
28	51.94	106.29	163.17	222.70	285.01
29	53.73	109.94	168.76	230.34	294.81
30	55.58	113.73	174.60	238.31	305.05
31	57.51	117.69	180.69	246.65	315.76
32	59.53	121.83	187.06	255.39	326.96
33	61.64	126.17	193.75	264.52	338.71
34	63.86	130.72	200.73	274.11	351.01
35	66.18	135.48	208.07	284.14	363.93
36	68.61	140.48	215.76	294.69	377.45
37	71.17	145.71	223.83	305.76	391.70
38	73.84	151.21	232.33	317.40	406.65
39	76.67	157.04	241.29	329.66	422.38
40	79.66	163.17	250.71	342.54	438.86

**N. B.—For the Value of a Policy, payable at any age from 45 to 55, take a case from the above table with the same term to run from issue.**

**TEN-PAYMENT ENDOWMENT AT 40.**  
**Net Value of a \$1,000 Policy at the end of various years.**

<i>Age at Issue.</i>	<i>1 Year.</i>	<i>2 Years.</i>	<i>3 Years.</i>	<i>4 Years.</i>	<i>5 Years.</i>
20	55.46	113.49	174.23	237.79	304.32
21	57.47	117.60	180.52	246.38	315.32
22	59.55	121.86	187.07	255.36	326.84
23	61.74	126.35	193.96	264.75	338.88
24	64.02	131.02	201.17	274.59	351.50
25	66.42	135.94	208.70	284.89	364.70
26	68.93	141.07	216.59	295.69	378.53
27	71.54	146.42	224.84	306.96	393.02
28	74.28	152.05	233.50	318.81	408.19
29	77.15	157.95	242.56	331.21	424.11
30	80.17	164.12	252.06	344.21	440.82

**N. B.—For the Value of a Policy, payable at any age below 45, take a case from the above table with the same term to run from issue.**

## TEN-PAYMENT ENDOWMENT AT 50.

(Continued.)

<i>Age at Issue.</i>	<i>6 Years.</i>	<i>7 Years.</i>	<i>8 Years.</i>	<i>9 Years.</i>	<i>10 Years.*</i>
20	270.61	323.29	378.44	436.18	496.65
21	279.14	333.49	390.40	449.99	512.41
22	288.04	344.14	402.89	464.41	528.87
23	297.33	355.26	415.92	479.47	546.05
24	307.03	366.86	429.54	495.19	564.00
25	317.15	378.98	443.75	511.62	582.77
26	327.72	391.64	458.61	528.80	602.39
27	338.76	404.86	474.14	546.75	622.90
28	350.30	418.69	490.37	565.53	644.38
29	362.36	433.15	507.35	585.19	666.85
30	374.98	448.27	525.14	605.76	690.39
31	388.18	464.11	543.75	627.32	715.05
32	402.01	480.69	563.24	649.90	740.90
33	416.50	498.08	583.69	673.58	768.01
34	431.67	516.30	605.13	698.42	796.44
35	447.60	535.41	627.62	724.47	826.27
36	464.31	555.48	651.23	751.81	857.58
37	481.88	576.55	675.98	780.50	890.48
38	500.32	598.65	701.98	810.65	925.08
39	519.68	621.88	729.30	842.36	961.54
40	540.00	646.26	758.03	875.78	1,000.00

## TEN-PAYMENT ENDOWMENT AT 40.

(Continued.)

<i>Age at Issue.</i>	<i>6 Years.</i>	<i>7 Years.</i>	<i>8 Years.</i>	<i>9 Years.</i>	<i>10 Years.*</i>
20	373.97	446.94	523.34	603.40	687.30
21	387.52	463.14	542.35	625.36	712.37
22	401.69	480.10	562.26	648.36	738.62
23	416.52	497.86	583.09	672.43	766.12
24	432.05	516.45	604.92	697.66	794.94
25	448.31	535.93	627.78	724.10	825.14
26	465.34	556.34	651.75	751.81	856.82
27	483.18	577.73	676.86	780.88	890.05
28	501.91	600.16	703.22	811.38	924.92
29	521.51	623.69	730.88	843.39	961.54
30	542.11	648.38	759.91	877.00	1,000.00

\* The policy is now paid-up, and the value at the end of succeeding years may be found from page 21.

## ORDINARY JOINT LIFE.

Net Value of a Policy of \$1,000 at the end of various years.

Ages at Issue.	1 Year.	2 Years.	3 Years.	4 Years.	5 Years.	10 Years.
<b>20</b> & 20	7.57	15.38	23.48	31.83	40.41	87.79
<b>25</b> & 20	8.47	17.24	26.25	35.57	45.20	98.01
" 25	9.25	18.82	28.70	38.88	49.38	106.77
<b>30</b> & 20	9.72	19.76	30.11	40.77	51.81	112.64
" 25	10.40	21.12	32.15	43.57	55.31	119.94
" 30	11.37	23.06	35.15	47.57	60.37	131.07
<b>35</b> & 20	11.48	23.35	35.61	48.33	61.44	133.83
" 25	12.04	24.41	37.24	50.47	64.16	139.50
" 30	12.83	26.07	39.71	53.82	68.41	148.64
" 35	14.12	28.65	43.67	59.18	75.24	163.69
<b>40</b> & 20	14.07	28.63	43.73	59.25	75.18	160.11
" 25	14.45	29.39	44.89	60.80	77.13	164.06
" 30	15.13	30.75	46.86	63.47	80.51	171.33
" 35	16.17	32.84	50.09	67.85	86.12	183.69
" 40	17.97	36.54	55.72	75.49	95.65	200.92
<b>45</b> & 20	17.42	35.14	53.23	71.69	90.43	188.44
" 25	17.67	35.71	54.12	72.83	91.83	191.24
" 30	18.15	36.67	55.49	74.69	94.20	196.52
" 35	18.99	38.36	58.11	78.25	98.78	206.63
" 40	20.46	41.41	62.82	84.64	106.77	220.67
" 45	22.78	45.81	69.10	92.62	116.40	237.22
<b>50</b> & 20	20.77	41.86	63.28	84.93	106.91	219.82
" 25	20.94	42.20	63.78	85.60	107.75	221.57
" 30	21.25	42.92	64.82	86.98	109.46	225.29
" 35	21.95	44.22	66.83	89.78	112.97	233.00
" 40	23.20	46.83	70.79	95.10	119.67	244.29
" 45	25.13	50.44	76.01	101.68	127.52	257.44
" 50	27.10	54.39	81.77	109.25	136.73	273.83
<b>55</b> & 20	24.72	49.70	74.95	100.38	125.99	254.57
" 25	24.87	49.93	75.16	100.75	126.43	255.48
" 30	25.10	50.37	75.92	101.65	127.56	257.84
" 35	25.52	51.22	77.29	103.54	130.07	263.45
" 40	26.52	53.32	80.41	107.77	135.32	272.05
" 45	28.10	56.29	84.68	113.07	141.56	282.05
" 50	29.72	59.44	89.26	119.08	148.91	294.76
" 55	31.83	63.66	95.49	127.21	158.82	311.42

## ORDINARY JOINT LIFE.

Net Value of a Policy of \$1,000 at the end of various years.

(Continued.)

Ages at Issue.	1 Year.	2 Years.	3 Years.	4 Years.	5 Years.	10 Years.
<b>60</b> & 20	29 36	58.82	88.18	117.53	146.79	289.31
" 25	29.40	58.91	88.31	117.82	147.12	289.74
" 30	29.61	59.21	88.71	118.32	147.72	291.12
" 35	29 80	59.71	89 62	119 52	149.33	295.12
" 40	30.60	61 31	92.01	122.82	153.32	301.47
" 45	31 86	63.73	95.37	126.91	158.12	308.55
" 50	33 18	66.14	98.87	131.38	163.66	317.72
" 55	34.80	69.36	103.68	137.77	171 37	330.42
" 60	37.32	74.12	110.54	146.30	181 42	345.08

## NET PREMIUMS—ORDINARY JOINT LIFE.

ACCORDING TO THE ACTUARIES' TABLE, AT 4 PER CENT.

<i>Ages.</i>	<i>Rate.</i>	<i>Ages.</i>	<i>Rate.</i>	<i>Ages.</i>	<i>Rate.</i>
20-20	21.14	45-20	35 06	55-40	55 25
		" 25	35 78	" 45	58.43
25-20	22.45	" 30	36 84	" 50	63.32
" 25	23.65	" 35	38 41	" 55	70.54
		" 40	40.86		
30-20	24.26	" 45	44.69	60-20	63.12
" 25	25.34			" 25	63.63
" 30	26.88	50-20	41.74	" 30	64.34
		" 25	42 37	" 35	65 38
35-20	26.76	" 30	43.29	" 40	67.06
" 25	27.69	" 35	44.67	" 45	69.92
" 30	29.07	" 40	46.84	" 50	74.41
" 35	31.08	" 45	50.34	" 55	81.13
		" 50	55.64	" 60	91.12
40-20	30.20				
" 25	31 03	55-20	50.77		
" 30	32.22	" 25	51.34		
" 35	34 03	" 30	52.14		
" 40	36.73	" 35	53 33		

# SYNOPSIS OF NET RATES AND RESERVES, ACCORDING TO THE AMERICAN TABLE AT 4½ PER CENT. **PREMIUMS.**

FORM OF INSURANCE.	AGE.				
	20	30	40	50	60
<b>LIFE, ORDINARY.</b>					
Annual .....	\$11.97	\$15.34	\$21.30	\$32.49	\$54.14
Ten-Payment .....	27.17	32.92	41.79	55.57	77.08
Twenty " .....	17.07	20.78	26.75	37.07	56.61
Single " .....	217.45	262.61	330.95	430.04	556.99
<b>TERM INSURANCE.</b>					
7 Years .....	7.61	8.34	10.07	15.61	32.19
<b>ORDINARY ENDOWMENT.</b>					
Policy with 10 Years to run .....	81.90	82.23	83.20	86.15	
" " 20 " " .....	35.43	36.05	37.75		
" " 30 " " .....	21.41	22.46			
<b>TEN-PAYMENT ENDOWMENT.</b>					
Policy with 20 Years to run .....	56.40	57.12	58.99		
" " 30 " " .....	41.50	42.97			
<b>VALUE OF AN ANNUITY OF \$1.</b>					
First Payment one year hence ..	17.17	16.12	14.54	12.24	9.29

## **RESERVES OR NET VALUES.**

FORM OF INSURANCE.	AGE AT ISSUE.				
	20	30	40	50	60
<b>LIFE, ORDINARY.</b>					
End of 1 Year .....	\$4.74	\$7.66	\$12.59	\$20.45	\$30.70
" 5 " .....	25.81	41.69	67.86	106.83	154.46
" 10 " .....	57.71	92.67	148.11	222.74	305.98
" 15 " .....	97.00	154.24	239.11	342.79	446.78
" 20 " .....	145.04	227.05	337.85	460.56	579.68
<b>LIFE, TEN-PAYMENT.</b>					
End of 1 Year .....	20.75	26.19	34.20	44.90	55.33
" 5 " .....	114.91	144.95	188.84	245.54	300.13
" 10 " .....	262.61	330.95	430.04	556.99	692.54
<b>ORDINARY ENDOWMENT AT 60.</b>					
End of 1 Year .....	8.49	15.17	29.95	77.31	
" 5 " .....	46.70	83.54	165.03	429.38	
" 10 " .....	105.75	189.23	374.54	1,000.00	
" 20 " .....	274.98	492.90	1,000.00		
<b>ORDINARY ENDOWMENT AT 50.</b>					
End of 1 Year .....	14.69	29.50	77.91		
" 5 " .....	81.17	163.36	433.44		
" 10 " .....	185.02	373.43	1,000.00		
" 20 " .....	489.36	1,000.00			
<b>TEN-PAYMENT ENDOWMENT AT 60.</b>					
End of 1 Year .....	27.02	36.78	52.35	77.31	
" 5 " .....	149.78	203.98	290.41	429.38	
" 10 " .....	342.79	467.16	666.73	1,000.00	
<b>TEN-PAYMENT ENDOWMENT AT 50.</b>					
End of 1 Year .....	35.84	51.70	77.91		
" 5 " .....	198.88	287.09	433.44		
" 10 " .....	455.69	658.95	1,000.00		

Although the author prefers the new mode of designating endowments by their terms to run, instead of the ages when payable, it was necessary to follow the old method in the preceding pages of Valuation Tables, because such a vast number of policies of the old form are now in force. For ready comparison the above Reserves are given in the same way; but in stating the Premiums as above, and on page 23, the new method has been used.



# PAID-UP INSURANCE

## ON ACCOUNT OF LAPSED POLICIES.

### 1st. Reduced Insurance similar to the Original Policy.

Limited-payment policies have their equivalent paid-up policies settled definitely by their own terms—as also the ordinary Endowment policies of most companies: but for ordinary Life policies no rule for determination has been generally adopted; some companies promise a policy for the amount of premiums paid—which is too small in some cases and too large in others.

In the case of all cash ordinary Life and Endowment policies, the paid-up policy may be obtained easily from this rule—adopted by some companies.

Find how much the actual annual premium paid would insure at the present age, deduct this from the amount of the policy, and we have the Extra Insurance due to the past payments:—in practice take off a margin of 20 or 25 per cent.

**EXAMPLE.**—Policy for \$2,000, issued 10 years ago at age 40, annual premium, \$61.56—premium now, \$46.51 per \$1,000. Dividing \$61.56 by \$0.04651 (the premium for \$1), we obtain \$1,324, nearly. Now as the person is insured for \$2,000—while his premium is only enough to secure \$1,324 at the present time, it is clear that the excess, \$676, is due to his former payments—taking off 1-5th we have, say \$540, the practical amount to which he is entitled.

Though always sufficiently correct, this rule is only perfectly so when the premium table has the same loading throughout: and its results will be based on the same mortality table that the premiums are.

The **GENERAL RULE** is to take the net value of the policy, less a margin of 20 or 25 per cent. and any outstanding note, and multiply it by the reversionary value of \$1 at the present age, and the product will be the answer.

Taking the same example as above, we find the net value to be \$325.94, deducting 20 per cent., and multiplying by the reversionary value of \$1 at age 50, \$2.08 (page 22), we have about \$540, as before.

Those that have paid by *half note* must not expect a paid-up policy for one-half as much as if they had paid all cash, as the above deductions from the net value of the policy may leave nothing to entitle them to anything at all.

**N. B.**—*In the case of a NOTE Policy, when the rule of the Company only applies to CASH policies.* Find the paid-up policy that would be given if it had been paid all cash, and deduct therefrom the reversionary value\* of the outstanding note.

**EXAMPLE.**—An ordinary Endowment at 50 for \$1,000, issued at age 30, ten years ago, has a note of \$30 outstanding; what paid-up policy should be allowed, the rule of the company for cash policies being to give one for the same proportion of the original, that the number of premiums paid is of the whole number to be paid?

By the rule for cash policies, the amount would be 10-20ths of \$1,000, or \$500. From page 22 we find at the present age, 40, the reversionary value of \$1.00 payable at "Death, or 50," is \$1.45; multiplying by \$30, we have \$43.50; subtracting this from the above, we find the paid-up policy to be, in round numbers, \$450.

\* In the opinion of some Actuaries this should be increased by about ten per cent.

## Ordinary Life Policy for \$1,000.

PREMIUMS PAID AND PAID-UP POLICY DUE AT END OF VARIOUS YEARS.

20 per cent. being taken from the Mathematical Amount of the latter, according to the General Rule.

Age at Issue.	Annual Premium.	End 5th Year.		End 10th Year.		End 20th Year.		End 30th Year.	
		Premiums Paid.	Paid-up Policy.	Premiums Paid.	Paid-up Policy.	Premiums Paid.	Paid-up Policy.	Premiums Paid.	Paid-up Policy.
25	19.63	98.15	106.00	196.30	207.00	392.60	392.00	588.90	538.00
35	26.49	132.45	129.00	264.90	249.00	529.80	447.00	794.70	587.00
45	38.47	192.35	155.00	384.70	287.00	769.40	491.00	1,164.10	623.00
55	60.04	300.20	174.00	600.40	318.00	1 200.80	524.00	1,801.20	652.00

### 2d. The Massachusetts Non-Forfeiture Method.

This gives a certain temporary extension of the full amount of insurance, no matter how little premium may have been paid on the lapsed policy; and has been obligatory on Massachusetts Companies since 1861. The Law, which may be found on page XIX. of the Report of 1867, provides that four-fifths of the net value of the policy at the time of lapsing, shall be employed to extend the insurance as long as possible, according to the Actuaries' Table at 4 per cent., and allows the amount of the forborne payments, with interest, to be deducted from the full amount payable in case of death during the term of extension.

*The following Example is from the Report of 1862.*

"A person aged 45 forfeits a policy for \$2,000, of which the net value is \$250. The company holds his premium note for \$150, leaving \$100 net to his credit. Deducting one-fifth, \$80 remain as the net single premium. Dividing it by the number of hundreds in the sum insured, we find there is \$4 per cent. By entering the (opposite) table, under age 45 we find the \$4 will insure \$100 at that age for more than three years and less than four; that is, not to regard extreme exactness, \$3.52 will insure it for three years, and \$4.69 for four years. Now to find the intermediate days in this case, we say as (the difference between \$3.52 and \$4.69) \$1.17 is to 365 days, so is (the excess of \$4 over \$3.52) \$0.48 to the answer, which is 150 days, nearly. Hence the policy will continue good against the Company for 3 years and 150 days."

**RULE.**—Find the value of the policy from the VALUATION TABLES, deduct the outstanding note (if any), divide four-fifths of the remainder by the number of hundreds in the sum insured, and refer to the opposite table, under the present age, as shown in the above example.

For ordinary life policies paid all cash, the extension may be found immediately from the table on pages 75 to 86 of the Collected Massachusetts Reports, from which the Examples below are taken.

No. of Prams. Paid.	AGE AT ISSUE.										No. of Prams. Paid.
	25		35		45		55		65		
	Years.	Days.	Years.	Days.	Years.	Days.	Years.	Days.	Years.	Days.	
1	—	293	1	3	1	61	—	338	—	224	1
5	4	72	5	56	4	306	3	208	2	90	5
10	8	272	9	24	7	136	5	22	3	29	10
15	12	145	10	359	8	83	5	142	3	67	15
20	14	53	11	160	8	24	5	27	2	325	20

## Single Premiums for a Temporary Insurance of \$100,

FOR FROM 1 TO 10 YEARS, FROM THE VARIOUS AGES AT THE TOP OF EACH COLUMN.

Years.	25	26	27	28	29	30	31	32	33	34	Years.
1	0.747	0.758	0.770	0.783	0.796	0.810	0.825	0.841	0.858	0.875	1
2	1.471	1.493	1.516	1.541	1.568	1.597	1.627	1.658	1.691	1.726	2
3	2.172	2.205	2.240	2.278	2.318	2.361	2.406	2.453	2.502	2.553	3
4	2.851	2.895	2.943	2.993	3.047	3.104	3.163	3.226	3.291	3.359	4
5	3.510	3.566	3.625	3.689	3.755	3.826	3.910	3.978	4.058	4.143	5
6	4.149	4.217	4.288	4.364	4.444	4.528	4.617	4.709	4.805	4.906	6
7	4.770	4.849	4.933	5.021	5.114	5.212	5.314	5.421	5.533	5.649	7
8	5.374	5.464	5.559	5.660	5.766	5.876	5.993	6.114	6.241	6.373	8
9	5.960	6.061	6.168	6.281	6.399	6.524	6.654	6.789	6.931	7.081	9
10	6.530	6.643	6.761	6.886	7.017	7.154	7.297	7.447	7.605	7.775	10

Years.	35	36	37	38	39	40	41	42	43	44	Years.
1	0.893	0.912	0.931	0.953	0.974	0.996	1.020	1.048	1.082	1.125	1
2	1.762	1.799	1.838	1.880	1.922	1.967	2.017	2.077	2.151	2.241	2
3	2.607	2.663	2.722	2.783	2.847	2.916	2.996	3.094	3.212	3.355	3
4	3.430	3.504	3.582	3.663	3.749	3.847	3.963	4.103	4.269	4.468	4
5	4.231	4.323	4.420	4.522	4.636	4.768	4.923	5.110	5.327	5.583	5
6	5.011	5.121	5.238	5.366	5.512	5.681	5.882	6.117	6.387	6.698	6
7	5.771	5.900	6.042	6.199	6.381	6.593	6.839	7.124	7.447	7.816	7
8	6.514	6.666	6.836	7.027	7.250	7.505	7.798	8.133	8.510	8.937	8
9	7.243	7.422	7.625	7.853	8.117	8.417	8.757	9.144	9.572	10.063	9
10	7.963	8.173	8.412	8.679	8.985	9.330	9.719	10.158	10.643	11.194	10

Years.	45	46	47	48	49	50	51	52	53	54	Years.
1	1.174	1.235	1.300	1.371	1.448	1.533	1.625	1.726	1.836	1.953	1
2	2.347	2.468	2.600	2.744	2.900	3.070	3.256	3.460	3.678	3.916	2
3	3.518	3.703	3.902	4.119	4.356	4.614	4.895	5.199	5.529	5.886	3
4	4.691	4.938	5.207	5.500	5.817	6.164	6.539	6.947	7.387	7.861	4
5	5.865	6.177	6.516	6.885	7.286	7.720	8.191	8.702	9.250	9.842	5
6	7.041	7.420	7.831	8.277	8.759	9.283	9.850	10.461	11.118	11.826	6
7	8.221	8.667	9.151	9.674	10.240	10.853	11.513	12.225	12.990	13.818	7
8	9.406	9.920	10.476	11.077	11.726	12.427	13.180	13.993	14.869	15.814	8
9	10.594	11.178	11.807	12.486	13.217	14.004	14.851	15.767	16.752	17.814	9
10	11.788	12.441	13.143	13.898	14.711	15.585	16.528	17.545	18.638	19.813	10

Years.	55	56	57	58	59	60	61	62	63	64	Years.
1	2.083	2.224	2.373	2.537	2.716	2.917	3.136	3.377	3.638	3.926	1
2	4.175	4.453	4.752	5.080	5.442	5.841	6.277	6.753	7.270	7.835	2
3	6.272	6.688	7.137	7.631	8.173	8.769	9.417	10.122	10.887	11.716	3
4	8.374	8.927	9.530	10.189	10.910	11.697	12.551	13.477	14.477	15.558	4
5	10.481	11.175	11.928	12.751	13.645	14.619	15.672	16.809	18.032	19.345	5
6	12.595	13.428	14.331	15.311	16.376	17.529	18.771	20.107	21.536	23.060	6
7	14.715	15.685	16.732	17.868	19.095	20.418	21.839	23.357	24.972	26.688	7
8	16.838	17.940	19.129	20.413	21.794	23.279	24.866	26.546	28.329	30.212	8
9	18.960	20.192	21.517	22.940	24.467	26.098	27.828	29.659	31.589	33.616	9
10	21.078	22.434	23.887	25.442	27.101	28.863	30.724	32.684	34.731	36.884	10

This is an abridgement of the large table to be found at page 173 of the Collected Massachusetts Reports.

# THE CONTRIBUTION PLAN

OF

## DIVIDING SURPLUS.

Surplus is derived from several sources; the margin on the premiums, low mortality, high interest, and the forfeiture and surrender of policies: thus the premiums are *larger*, while the losses from death are generally *less*, than according to theory, and from *six* to *ten* per cent. interest is received on the accumulations, where only *four* per cent. had been reckoned on.

The "Contribution" method of making dividends is to calculate how much each member has contributed to the general surplus, and give him a corresponding share, and is so simple that it has only to be stated to be understood. We have only to *credit* each member with the reserve on hand and the annual premium paid at the beginning of the year, improved at the actual interest, and *charge* him with the sum that has to be reserved for his policy at the end of the year, and the actual cost of insuring him during it—and the balance will be the contribution to surplus from his policy.

To apply this, let us suppose that, in a certain company, making its reserves according to the Actuaries' Table at 4 per cent., the mortality has been three-fourths of what was to be expected according to that table, that 7 per cent. has been received on all funds, and that the profits from surrenders and forfeitures have been sufficient to pay the expenses: and take the following examples:—

EXAMPLE I.—To find the contribution of an ordinary life policy during its 2d year, amount, \$1,000; age at issue, 40; premium, \$31.73, annual.

At the end of the first year the reserve accumulated from his previous payment was .....	\$14.41
And the annual premium then paid .....	31.73
Total on account of policy at the beginning of 2d year .....	46.14
Interest during year, 7 per cent. ....	3.23
<b>TOTAL CREDIT</b> .....	<b>49.37</b>
Reserve required at end of 2d year .....	\$29.31
Cost of insuring him during it (which we obtain by multiplying three-fourths of the rate of mortality at 41, his age at the beginning of the year, by \$1,000—29.31, or \$970.69, that being the amount really at risk, as the company will at the year's end have \$29.31 on hand*) = .00796 x \$970.69 .....	7.73
	37.04
<b>CONTRIBUTION</b> .....	<b>\$12.33</b>

EXAMPLE II.—To find the contribution from the above policy during its 10th year,

Reserve at end of 9th year.....	\$145 14	
Premium paid at beginning of 10th year.....	31.73	
		\$176 87
Interest, 7 per cent.....		12 38
TOTAL CREDIT.....		\$189 25
Reserve required at end of 10th year.....	\$162 97	
Cost of the insurance (three-fourths of the mortality at age 49, multiplied by \$1,000—\$162.97) $\times .01129 \times \$837.03$ .....	9.45	
		172 42
CONTRIBUTION.....		\$16 83

From these two examples we see that (other things being equal) the longer a policy is in force the larger its dividends should be, because the larger the reserve the greater the gain from high interest.

EXAMPLE III.—Now let us suppose that this last policy had, at the beginning of the 10th year, *reversionary additions* of \$250—and let us find what surplus has been derived from them.

Reserve required for \$250, at age 49 (=single premium, page 21).....	\$117.72	
Interest, 7 per cent.....	8.24	
TOTAL CREDIT.....		\$125.96
Reserve required at end of year.....	\$120.48	
Cost of insurance as before, .01129 multiplied by \$250—\$120.48, or \$129.52.....	1.46	
		121 94
CONTRIBUTION from reversionary additions.....		\$4 02
Which added to the above contribution from the policy, gives.....		\$20 85

EXAMPLE IV.—To find the contribution during the second year of an Endowment policy for \$1,000, issued at age 40, payable at death or 50, annual premium \$96.

Reserve at end of 1st year.....	\$79.66	
Premium at beginning of 2d year.....	96.00	
		\$175 66
Interest, 7 per cent.....		12.30
TOTAL CREDIT.....		\$187.96
Reserve at end of 2d year.....	\$163.16	
Cost of insurance, as in Example I., .00796 $\times$ (\$1,000—\$163.16, or \$836.84).....	6.66	
		169 82
CONTRIBUTION.....		\$18.14

In the first example, we saw that the contribution of an ordinary life policy was nearly forty per cent. of its premium, and from the last we see that the contribution of an endowment is only about twenty per cent. of the premium, both policies issued at the same age, and in force for the same time; and, as this may surprise the reader, it will be well to explain why it is so.

In the first place, the life premium is loaded 33 per cent., nearly, and the endowment only about 12; and in the second place, the gain from low mortality is a less proportion of the endowment than of the life premium: so that though the surplus from the endowment is actually the larger, it is not as large in proportion as that of the life policy.

EXAMPLE V.—Let us now find the contribution from the same endowment during its 10th year.

Reserve at end of 9th year.....	\$875.77	
Premium paid at beginning of 10th year.....	96.00	\$971.77
Interest.....		68.02
TOTAL CREDIT.....		\$1,039.79
Reserve at end of 10th year.....	\$1,000.00	
Cost of insurance during year, calculated as before.....	0.00	1,000.00
CONTRIBUTION.....		\$39.79

Comparing this with Example II., we see that the life policy has again the larger percentage of contribution, though Example V. shows a much greater increase over Example IV. than Example II. does over Example I.—owing to the gain from interest on the vastly increased reserves of the endowment.

The contributions of single-premium policies are obtained as in the case of the reversionary additions in Example III., and are in general about 4 per cent. of the net present values of the policies.

The contributions of limited-payment policies, during the term of payment, are calculated the same as those of the ordinary form, and afterwards, when fully paid-up, they are entitled to dividends as single-premium policies; for, though no more premiums are paid, the company gains considerable surplus every year from what had been previously accumulated, to meet a lower rate of interest and higher mortality than is actually experienced.

The Contribution Plan was introduced by the "Mutual Life," of New York, in 1863, when it was employed to divide the surplus of the previous five years, and it may not be improper to give the following generous letter from the Actuary of the Company:—

New York, January 4th, 1865.

MY DEAR FACKLER—It gives me great pleasure to acknowledge to you, as I did in my official report to the Company, and as I have always done verbally, that whatever credit may attach to the origination and successful application of entirely new principles and formulæ to the distribution of the surplus of a Life Insurance Company (as in the case of the dividend for 1858-62 of the Mutual Life), should be justly shared by yourself.

Indeed, the principle upon which that dividend was based, as well as some of the most important elements of the main formulæ, were first suggested by you.

In fact, I am free to acknowledge that without your valuable assistance, it is probable that the work might not have been brought to such a successful completion.

You are at liberty to make such use of this communication as you may think proper.

Sincerely yours,

SHEPPARD HOMANS.

To

Mr. DAVID PARKS FACKLER, Asst. Actuary.

## REDUCTION OF PREMIUM.

To find what reduction of future premiums should be allowed on the surrender of certain cash dividends, or reversionary additions, proceed as follows:—*for the case of cash dividends on an ordinary life policy*, divide by the value (at the present age), of a 4 per cent. annuity, plus one (unless the reduction is not to begin until a year after), page 20, and the quotient will be the amount of annual reduction, beginning with next annual settlement.

In the case of *reversionary additions to an ordinary life policy*, find their present cash value\* from page 21, and proceed as above.

EXAMPLE.—A person aged 50 has \$559 of reversionary additions, what reduction should be made on the premium just becoming due and on all succeeding ones?

From page 21 we find the present cash value to be \$269.40, which divided by (1 + the annuity,) \$13.47, gives \$20.00 as the annual reduction.

For *ordinary endowments* use the proper term annuity as found or estimated from the table below, *without adding one*, however, as that is included already.

EXAMPLE.—A person aged 38 has \$200 reversionary additions to his policy, which is payable at death or 50.

From page 21, we find the cash value of the reversions to be \$128.88: this divided by the value of an annuity for twelve years from age 38, which we estimate from the table to be about \$9.20, makes the annual reduction about \$14.

*Value of an Annuity of \$1.00 payable at the beginning of each year.*

*During a Certain Term of the Life of a Person of a Certain Age.*

PRESENT AGE.	T E R M .					
	5 Years.	10 Years.	15 Years.	20 Years.	25 Years.	30 Years.
25	\$4.56	\$8.16	\$10.98	\$13.19	\$14.89	\$16.19
30	4.55	8.13	10.92	13.09	14.74	15.98
35	4.55	8.10	10.85	12.94	14.50	15.60
40	4.54	8.05	10.73	12.71	14.12	
45	4.52	7.96	10.51	12.32		
50	4.48	7.81	10.17			
55	4.43	7.58				
60	4.35					

A tolerable off-hand estimate of the reduction, in lieu of a reversion, may be made thus:—Find the annual premium, at the present age, requisite to insure the same reversion, and deduct therefrom the known proportion of margin.

Thus, take the first Example above, and suppose that the Company's rate per thousand is \$47.71, and that one-fourth of that is margin; the Company's charge for the insurance of \$559 would be \$26.66, from which, taking one-fourth, we have \$20 left, as the reduction he is entitled to. For it is clear that if the Company would charge him the gross premium, \$26.66, for an insurance of \$559, they should allow him about the net \$20 annually to be relieved of the same insurance.

To find how much reversionary addition must be surrendered to cancel a cash premium, multiply the premium by the reversionary value\* of \$1.00, at the present age, page 22, and the product is the answer.

\* N. B.—Some Actuaries would make a margin of 10 per cent. in favor of the Company.

## MISCELLANEA.

**RELATION BETWEEN RATES OF MORTALITY AND PREMIUMS.** Premiums based on two different tables, whose rates of mortality at each age are as one to two, will not be in the same ratio, as will be readily seen from this hypothesis :

Suppose that two life insurance companies have each the same number of persons insured at the same age, and that those in the former are ordinary risks, and those in the latter invalids with a mortuary rate double the ordinary rate ; during the first year the deaths in the second company will be exactly double those in the first one, but the next year, and thereafter, that will not be the case, because there will be fewer left to be affected by the higher mortality, and in the end the total deaths in each company will be the same. We see from this, that while the premium for one year's insurance in the second company should be double that in the first, the single premium for two years' insurance should be less than double, for three years' insurance still less than double, and so on ; the annual premiums for the second company would have to be increased more in proportion than the single premiums, because fewer would be received, as the deaths occur earlier. Endowment premiums for short terms are the least affected by high mortality. See *Insurance Monitor*, August, 1867, page 487.

**FEMALE RISKS.** All authorities seem agreed, that a female, if thoroughly sound, is fully as good, if not a better risk than a male ; and that the risk of imperfect examination can be met either by charging an extra, or by accepting only those passed by the most reliable examiners. The experience of some companies in this respect has been very favorable, and that of others quite the opposite. From page 20, Farr table, we see that an annuity on a female costs more than on a male, and consequently an insurance must cost less.

**LIMIT OF LOAN ON POLICIES.** Theoretically the amount loaned on a policy should at no time be larger than its net value ; so that just after an annual premium has been paid, the *loan-limit* would be the value of the policy just before the next premium becomes due—provided, however, the interest be paid in advance, for, if it be payable at the end of the year—only the value discounted at current interest could be loaned, so that loan and interest together shall not exceed the net value.



**ANNUITIES** are not popular here, because they offer persons under fifty-five an income little, if any, larger than can be obtained from interest on secure investments. Would they not be more popular, if mutuality were introduced into their management? Any surplus from the business would thus be given the annuitants, while the companies would at the same time be protected from loss.

---

SEVERAL RULES FOR  
CLOSE PRACTICAL ESTIMATES.

---

**For the sum requisite to pay up a policy after several premiums have been paid.** Make a liberal estimate of the amount of paid-up insurance due on account of past payments (page 45), subtract it from the amount of the policy, and find how much must be paid, to insure the balance, according to the single premium table of the company, which will be about the answer required.

Thus, for example, on a ten-payment life policy for \$1,000, issued at age 40, four years ago, a paid-up policy of \$400 would now be due, if no more payments are made; this taken from \$1,000 leaves \$600 yet to be paid for, according to the single-premium table of the company at age 44.

**For the net values at the end of the first few years.** Add a year's interest (at the table rate), to the net premium per thousand according to the mortality table, and deduct therefrom the rate of mortality per thousand, the remainder will be the required reserve nearly; for the end of the second and third years, double or treble the same. This applies to any form of policy except single and five payments, as in those the *self-insurance*, as Prof. Wright expresses it, is too large to disregard.

**For the Ten-Payment Joint-Life Premium.** Find at what age the ordinary single-life premium corresponds to the ordinary joint-life premium on the two lives; the single-life ten-payment premium at that age will be about the answer required.

**To compare the Cost of Insurance in different Companies.\*** Add interest on the premium up to the time of receiving dividend, and then deduct the latter, and the balance will be a fair criterion; or, discount the dividend according to page 10, and subtract it from the premium.

\* The true measure of mortuary experience is the ratio of the losses, not to the year's income, but to the average amount at risk during the year.

# TONTINES:

THEIR NATURE AND HOW THEIR PROFITS ARE DIVIDED.

Tontines, though so much patronized in France and Germany, are so little known here that, for most readers, it will be necessary to define them. A *Tontine*\* fund is one formed by subscription, on the condition that if any member die, his subscription becomes the property of the survivors. It may be compared to a large *family*, each departing member of which bequeaths to the others that for which he has no more earthly need.

The difference between Tontines and Annuities is this; an annuity income remains fixed for life, while a tontine income increases rapidly, as the recipient becomes more and more feeble with advancing age, and as the purchasing power of money diminishes.

Tontines are the counterpart of life insurance, and may be styled the *Staff* of old age, just as life insurance is the *Shield* of the widowed and orphaned. Hundreds of people in Europe have had their old age sustained in comfort, and even luxury, through the liberal income obtained from a moderate subscription in a tontine fund.

Each member receives interest on his deposit; and a share of the lapsed deposits of deceased members.

It is clear that an old man should have a larger share of the "*lapses*" than a young one, because the former runs a greater risk of lapsing his deposit by death, and will not be able to enjoy the benefits of the Association as long as the other.

The European method of apportioning those "*lapses*" does not pay sufficient regard to differences in age, and is not so scientific as that proposed in this country, and explained by this example:

If one hundred men, at the age of eighty, deposit \$100 each in a fund, and the mortality should be according to the Farr table, there will be fifteen lapsed shares the first year to divide among eighty-five survivors, so that each will receive  $\frac{1}{5} \times \$100$  (with a year's interest). If we make the same suppositions for one hundred men, aged fifty, we shall have two deaths and ninety-eight survivors, each having a share of  $\frac{2}{98} \times \$100$ .

From this, it is clear that men of eighty and fifty, subscribing the same amounts to the same fund, should share the "*lapses*" in the proportion of  $\frac{1}{5} \times \$100$  to  $\frac{2}{98} \times \$100$ . So that, in general, when persons of all ages subscribe to the same fund, each should share in proportion to the quantity,  $\frac{\text{the tabular deaths at his present age}}{\text{the number surviving to the next age}} \times \text{deposit} (= \frac{dx}{1x+1} \times \text{deposit})$ . The actual deaths may be under or over the *tabular expectation*, but the above proportion will give each member an equitable share of the same.

Subscriptions may be made either for life, or a term of years; and money once deposited is not forever locked up, as the Association can well afford to return the deposits of those who are in good health, making a small deduction therefrom.

\* So called after Lorenzo Tonti, who introduced them in the middle of the seventeenth century.

## DEFINITIONS & DISTINCTIONS.

**Actuary.** A person skilled in the theories and mathematical calculations on which Life Insurance is founded and conducted.

**Assured and Insured.** The party in whose favor the policy stands is the *Assured*; the party on whom the risk is taken, the *Insured*.

**Deferred Premium,** is the balance of the full year's premium, to be paid before the end of the *policy-year*, which the company could deduct in case of death before that time: thus on the 31st of December,

A policy dated Nov. 1st, premium qtrly. has 3 qtrs. deferred:

"	"	May	"	"	"	1	"	"
"	"	Sep.	"	"	s.annl.	1	s.annl.	"
"	"	Mar.	"	"	"	"	no	"

and, as the liabilities are calculated on the supposition that the full annual premiums were paid, the company is entitled to consider the sum of these deferred premiums as Assets, after allowing for the expense that would necessarily be incurred in collection.

**Margin, or Loading**—an amount added to, or subtracted from, the net rates or results, to provide for expenses and contingencies. To arrange this, so as to avoid inconsistencies and absurdities, requires skill and experience: an ingenious method suggested by Mr. Phillips, of the "Equitable," has been adopted by several prominent companies.

**Policy-Year**—the time between the dates that successive annual premiums are due.

**Premiums in Course of Transmission,** are those due, and not yet received by the head office of a company, though probably paid at the agency. As the company charges itself with reserves for the policies, just as if the premiums had actually been received, it has a right to credit itself with these premiums less the commissions payable on them; provided that in general, none are included, that are three months over due.

**Reserves,** are, in general, the amounts that should be *reserved* from past payments to enable a company to fulfil its future obligations. If the premiums paid each year were just sufficient for the current risk (as in Fire Insurance), no reserve would be requisite

when the next premium became due; but the practice of averaging the premium for the whole term of the policy, makes it larger than required by the risk at first, and smaller afterwards, so that the excess for the earlier years must be reserved, to provide for a deficiency during the later ones.

**Survivorship and Joint-life Policies.** The distinction between these is this, the former is payable to A only in case he survive B; the latter is payable at the death of either.

**A Survivorship Annuity**, is one payable to A in case he survive B.

**Surplus**, in a Life Insurance Company, is the excess of the assets over the liabilities, so that a company with large *assets* may have no *surplus*.

**Valuations by net and by gross Premiums.** A valuation by *net* premiums may be made in two ways:

The *first*, and most usual in this country, is to consider that only the mathematical premiums, according to the mortality table used in the valuations, will be received in future, and that any excess of the actual premiums over those, is required for expenses and contingencies.

Illustration—Ordinary Life Policy for \$1,000, issued at age 40, five years ago, premium \$31.73 annually.

Liability for \$1,000 on life, aged 45, Actuaries' 4 per cent.....	\$428.57
Value of future net premiums, page 26, " " \$23.68	
Multiplied by (the value of an annuity plus one,) 14.857.....	351.81
Balance of liability or valuation.....	\$76.76

The *second*, is to value the future actual premiums, less a per centage for expenses and contingencies.—

Illustration—Thus taking off 20 per cent. from the actual premium as above, we have,	
Liability as above.....	\$428.57
Value of future premiums, \$25.38 x 14.857.....	377.07
Balance of liability or valuation.....	\$51.50

In a valuation by *gross* premiums, which may be called emphatically a *gross* method, a company offsets its liabilities, by valuing the full future premiums receivable, without any deduction for commissions and expenses; and thus sometimes figures out a surplus larger than its assets or even its receipts.

Illustration with above example.	
Liability.....	\$428.57
Value of future premiums, \$31.73 x 14.857.....	471.41
Excess of latter over former.....	\$42.84

So that, though the company may have no assets, it has a surplus.

For interesting articles on these subjects, see the Massachusetts Reports of 1859 and 1860.

## APPENDIX.

In applying algebra to Life Insurance we designate the tabular number living at any age (page 15) by  $l$ , with the age suffixed: thus the number living at 50 is written  $l_{50}$ , and that at any age in general,  $l_x$ : the deaths at these ages are represented on the same plan, by  $d_{50}$ , and  $d_x$  respectively.

The value of \$1.00, receivable one year hence, is expressed by  $v$ , if payable two years hence, by  $v^2$ , and if  $x$  years hence, by  $v^x$ .

To find the present value of an *Annuity* of \$1.00 payable at the *beginning of every year* that a person now aged 50 may be living, which is designated  $A_{50}$ , we make the following equation:

$$A_{50} = \frac{l_{50} + v l_{51} + v^2 l_{52} + \dots + v^{49} l_{99}}{l_{50}}, \text{ (supposing none to reach}$$

100); the numerator of the fraction is the value of an annuity of \$1.00 on the lives of all now living at 50, which divided by  $l_{50}$ , is of course the value of an annuity on a single life. The general

formula is  $A_x = \frac{l_x + v l_{x+1} + v^2 l_{x+2} + \dots + v^{99-x} l_{99}}{l_x}$ .

For a reason, which will appear hereafter, we multiply both numerator and denominator by  $v^x$ , which does not affect the value,

and gives  $A_x = \frac{v^x l_x + v^{x+1} l_{x+1} + v^{x+2} l_{x+2} + \dots + v^{99} l_{99}}{v^x l_x}$ .

Representing  $v^x l_x$  by  $D_x$

$$A_x = \frac{D_x + D_{x+1} + D_{x+2} + \dots + D_{99}}{D_x}, \text{ making the sum of the D's for}$$

the age  $x$  and over it  $= N_x$ , we have  $A_x = \frac{N_x}{D_x}$ . (1)

To calculate the  $D$  and  $N$  for every age is a simple though laborious operation, but once performed, it enables us to solve any problem in annuities with perfect ease: thus

TEMPORARY ANNUITY for  $n$  years }  
during the life of a person aged  $x$ , }  $= A_{x:n} = \frac{N_x - N_{x+n}}{D_x}$ . (2)

DEFERRED ANNUITY, first payment  $n$  years hence  $= {}_nA_x = \frac{N_{x+n}}{D_x}$ . (3)

Let us now find the SINGLE PREMIUM for an INSURANCE of \$1 on a person aged  $x$  (to be paid at the end of the year in which he dies), which we represent by  $II_x$ , (pi,) arguing as before, we have \*

$$II_x = \frac{v d_x + v^2 d_{x+1} + v^3 d_{x+2} + \&c.}{l_x} \left\{ \begin{array}{l} \text{Multiplying by } v^x \text{ as before and} \\ \text{representing } v^{x+1} d_x \text{ by } C_x, \&c., \end{array} \right.$$

$$II_x = \frac{C_x + C_{x+1} + C_{x+2} + \dots + C_{99}}{D_x} \text{ Putting } M_x \text{ for the sum of the } C_s,$$

$$II_x = \frac{M_x}{D_x} \dots \dots \dots (4)$$

To find the ANNUAL PREMIUM,  $\varphi_x$ , (phi,) is to find what annuity paid at the beginning of each year is equal in value to  $II_x$ .

$$\text{Dividing (4) by (1), } \varphi_x = \frac{M_x}{D_x} \times \frac{D_x}{N_x} = \frac{M_x}{N_x} \dots \dots (5)$$

The **Ds**, **Ns** and **Ms** for every age form "Commutation Columns," and with a fourth headed **R** (equal to the sum of the **Ms** at and over any age) enable us to solve any problem presented by the business in this country. The advantage resulting from the artifice of multiplying by  $v^x$  is now obvious, as it saves the trouble and danger of error involved in numerous multiplications by different powers of  $v$  for each example.

Substituting  $l_x - l_{x+1}$  for  $d_x$ ,  $l_{x+1} - l_{x+2}$  for  $d_{x+1}$ , &c., in the first equation at the top of this page, then bringing the positive and negative terms together and combining them with the first equation on the previous page, we have

$$II_x = 1 - (1 - v) A_x \text{ and } \varphi_x = \frac{1}{A_x} - (1 - v)$$

$$\text{Premium for } n \text{ years, whole life insurance} = {}^n\varphi_x = \frac{M_x}{N_x - N_{x+n}} \quad (6)$$

$$\left. \begin{array}{l} \text{TERM} \\ \text{INSURANCE} \end{array} \right\} \text{ for } m \text{ years, annual premium} = \varphi_{x|m} = \frac{M_x - M_{x+m}}{N_x - N_{x+m}} \quad (7)$$

$$\text{SIMPLE ENDOWMENT, payable only if alive } m \text{ years hence, single premium} = E_{x|m} = \frac{D_{x+m}}{D_x} (8); \text{ annual premium} = e_{x+m} = \frac{D_{x+m}}{N_x - N_{x+m}} \quad (9)$$

$$\text{ENDOWMENT INSURANCE, payable after } m \text{ years or at previous death, single premium} = (E + II)_{x|m} = \frac{D_{x+m} + M_x - M_{x+m}}{D_x} \quad (10)$$

$$\text{the ordinary annual premium} = (c + \varphi)_{x|m} = \frac{\text{last numerator}}{N_x - N_{x+m}} \quad (11)$$

$$\text{and the premium for } n \text{ years} = {}^n(e + \varphi)_{x|m} = \frac{\text{last numerator}}{N_x - N_{x+n}} \quad (12)$$

Both (10) and (11) may be obtained from temporary annuities on the same principle that  $H_x$  and  $\varphi_x$  are obtained from whole life annuities above.

WHOLE LIFE INSURANCE, *all premiums returned at death*, without interest. Net premiums to provide for the return of gross premiums  $g$  times greater.

$$\text{Single premium} = \frac{M_x}{D_x - gM_x} \quad (13). \quad \text{Annual premium} = \frac{M_x}{N_x - gR_x}. \quad (14)$$

$$\text{Annual premium for } n \text{ years} = \frac{M_x}{(N_x - N_{x+n}) - g(R_x - R_{x+n})}. \quad (15)$$

RESERVE *for*, or VALUE *of* a policy, issued at age  $x$ , at the end of  $n$  years, next premium just due  $= H_x^* =$  in general, the single premium for the insurance at the present age, *minus* the present value of the future premiums payable.

$$\text{For an ordinary Life policy, } H_x^n = H_{x+n} - \varphi_x \times A_{x+n} \quad (16)$$

$$\text{also} = (\varphi_{x+n} - \varphi_x) A_{x+n} \quad (17) \quad \text{and} \quad \text{also} = 1 - \frac{A_{x+n}}{A_x} \quad (18)$$

the two latter being obtained by substitutions in (16).

For an ordinary Endowment Insurance policy the same formulas apply, using the proper term annuities.

A GENERAL ACCUMULATION FORMULA for finding the value at the end of any year from that at the end of the previous one.

$$H_x^{n+1} = (H_x^n + \varphi_x) u_{x+n} - k_{x+n} \quad (19)$$

Demonstration. Denote the amount of \$1.00 in one year from interest by  $r$ , then from the general theory of reserves and mortality,  $l_{x+n} (H_x^n + \varphi_x) r - d_{x+n} = l_{x+n+1} H_x^{n+1}$ , dividing by  $l_{x+n+1}$ , we have

$$\frac{r \cdot l_{x+n}}{l_{x+n+1}} (H_x^n + \varphi_x) - \frac{d_{x+n}}{l_{x+n+1}} = H_x^{n+1}$$

Putting the first fraction  $= u_{x+n}$  and the second  $= k_{x+n}$  (*kost*), we have the above.

$$\text{It is easy to see that } u_x = \frac{D_x}{D_{x+1}}, \text{ and } k_x = \frac{C_x}{D_{x+1}}.$$

This formula, as compared with Prof. Wright's, has these advantages:—it saves one operation in finding the reserve at the end of the first year, when the computer already has the logarithm of the premium—and  $k_x$  is the same for all percentages.

## Actuaries' or Combined Experience—4 per Cent.

AGES.	D.	N.	M.	R.	AGES.
15	53,658.53	1,073,044.0	12,387.62	359,512.4	15
16	51,236.50	1,019,385.5	12,029.36	347,124.7	16
17	48,920.88	968,149.0	11,684.38	335,095.4	17
18	46,707.09	919,228.1	11,352.17	323,411.0	18
19	44,590.29	872,521.0	11,031.78	312,058.8	19
20	42,566.30	827,930.7	10,722.81	301,027.0	20
21	40,630.73	785,364.4	10,424.40	290,304.2	21
22	38,779.80	744,733.7	10,136.21	279,879.8	22
23	37,009.95	705,953.9	9,857.877	269,743.6	23
24	35,317.31	668,944.0	9,588.693	259,885.8	24
25	33,698.62	633,626.6	9,328.362	250,297.1	25
26	32,150.75	599,928.0	9,076.601	240,968.7	26
27	30,670.38	567,777.3	8,832.789	231,892.1	27
28	29,254.64	537,106.9	8,596.687	223,059.3	28
29	27,900.53	507,852.3	8,367.742	214,462.6	29
30	26,605.43	479,951.7	8,145.752	206,094.9	30
31	25,366.62	453,346.3	7,930.226	197,949.1	31
32	24,181.75	427,979.7	7,720.993	190,018.9	32
33	23,048.31	403,797.9	7,517.615	182,297.9	33
34	21,964.18	380,749.6	7,319.951	174,780.3	34
35	20,927.30	358,785.4	7,127.862	167,460.3	35
36	19,935.51	337,858.1	6,940.969	160,332.5	36
37	18,986.94	317,922.6	6,759.154	153,391.5	37
38	18,079.83	298,935.7	6,582.305	146,632.4	38
39	17,212.24	280,855.9	6,410.092	140,050.1	39
40	16,382.56	263,643.6	6,242.419	133,640.0	40
41	15,589.23	247,261.1	6,079.193	127,397.5	41
42	14,830.58	231,671.8	5,920.126	121,318.4	42
43	14,104.82	216,841.2	5,764.770	115,398.2	43
44	13,409.74	202,736.4	5,612.184	109,633.5	44
45	12,743.15	189,326.7	5,461.358	104,021.3	45
46	12,103.40	176,583.5	5,311.724	98,559.91	46
47	11,488.46	164,480.1	5,162.305	93,248.19	47
48	10,897.30	152,991.7	5,013.002	88,085.88	48
49	10,328.76	142,094.4	4,863.588	83,072.88	49
50	9,781.917	131,765.6	4,714.011	78,209.29	50
51	9,255.776	121,983.7	4,564.097	73,495.28	51
52	8,749.396	112,727.9	4,413.706	68,931.19	52
53	8,261.892	103,978.5	4,262.718	64,517.48	53
54	7,792.454	95,716.61	4,111.043	60,254.76	54
55	7,340.540	87,924.18	3,958.840	56,143.72	55
56	6,905.300	80,583.61	3,805.931	52,184.88	56
57	6,486.163	73,678.34	3,652.379	48,378.95	57
58	6,082.776	67,192.18	3,498.461	44,726.57	58
59	5,694.499	61,109.41	3,344.137	41,228.11	59
60	5,320.816	55,414.91	3,189.473	37,883.97	60
61	4,960.965	50,094.09	3,034.269	34,694.50	61
62	4,614.595	45,133.13	2,878.706	31,660.23	62
63	4,281.278	40,518.53	2,722.873	28,781.52	63
64	3,960.842	36,237.25	2,567.101	26,058.65	64
65	3,653.017	32,276.41	2,411.617	23,491.55	65
66	3,357.679	28,623.39	2,256.779	21,079.93	66
67	3,074.814	25,265.71	2,103.056	18,823.15	67
68	2,804.366	22,190.90	1,950.870	16,720.10	68
69	2,546.499	19,386.53	1,800.864	14,769.23	69
70	2,301.430	16,840.04	1,653.737	12,968.36	70
71	2,069.223	14,538.61	1,510.046	11,314.63	71
72	1,850.049	12,469.38	1,370.457	9,804.581	72
73	1,644.044	10,619.33	1,235.608	8,434.125	73
74	1,451.369	8,975.290	1,106.166	7,198.517	74
75	1,272.086	7,523.920	982.7048	6,092.351	75

N. B.—These amounts are abbreviated from a larger number of decimals, so that in some cases the last figures of the D and N, or of the M and R columns will not exactly agree.



## Actuaries' or Combined Experience—5 per Cent.

AGES.	D.	N.	M.	R.	AGES.
15	46,483.56	802,277	8,279.964	208,931.4	15
16	43,962.68	755,793	7,972.571	200,651.5	16
17	41,576.02	711,830	7,679.379	192,678.9	17
18	39,316.55	670,254	7,399.734	184,999.5	18
19	37,177.23	630,937	7,132.614	177,599.8	19
20	35,151.72	593,760	6,877.459	170,467.2	20
21	33,233.75	558,608	6,633.379	163,589.7	21
22	31,417.71	525,374	6,399.895	156,956.3	22
23	29,698.29	493,956	6,176.553	150,556.4	23
24	28,070.13	464,258	5,962.607	144,379.9	24
25	26,528.52	436,188	5,757.666	138,417.3	25
26	25,068.95	409,659	5,561.360	132,659.6	26
27	23,686.90	384,590	5,373.063	127,098.2	27
28	22,378.34	360,903	5,192.457	121,725.2	28
29	21,139.25	338,525	5,018.993	116,532.7	29
30	19,966.02	317,386	4,852.401	111,513.7	30
31	18,855.06	297,420	4,692.200	106,661.3	31
32	17,803.16	278,565	4,538.158	101,969.1	32
33	16,807.08	260,762	4,389.853	97,430.97	33
34	15,863.98	243,955	4,247.086	93,041.12	34
35	14,971.13	228,091	4,109.668	88,794.03	35
36	14,125.79	213,120	3,977.240	84,684.36	36
37	13,325.53	198,994	3,849.638	80,707.12	37
38	12,568.05	185,668	3,726.703	76,857.48	38
39	11,851.00	173,100	3,608.130	73,130.78	39
40	11,172.32	161,249	3,493.783	69,522.65	40
41	10,530.05	150,077	3,383.529	66,028.87	41
42	9,922.197	139,547	3,277.107	62,645.34	42
43	9,346.764	129,625	3,174.158	59,368.23	43
44	8,801.528	120,278	3,074.008	56,194.08	44
45	8,284.356	111,476	2,975.956	53,120.07	45
46	7,793.512	103,192	2,879.605	50,144.11	46
47	7,327.095	95,398.7	2,784.309	47,264.51	47
48	6,883.873	88,071.6	2,689.993	44,480.20	48
49	6,462.581	81,187.7	2,596.506	41,790.21	49
50	6,062.143	74,725.1	2,503.809	39,193.70	50
51	5,681.448	68,663.0	2,411.788	36,689.89	51
52	5,319.470	62,981.6	2,320.353	34,278.10	52
53	4,975.228	57,662.1	2,229.429	31,957.75	53
54	4,647.854	52,686.9	2,138.962	29,728.32	54
55	4,336.610	48,039.0	2,049.044	27,589.36	55
56	4,040.629	43,702.4	1,959.560	25,540.31	56
57	3,759.224	39,661.8	1,870.574	23,580.74	57
58	3,491.856	35,902.6	1,782.217	21,710.17	58
59	3,237.830	32,410.7	1,694.470	19,927.95	59
60	2,996.545	29,172.9	1,607.367	18,233.48	60
61	2,767.274	26,176.4	1,520.793	16,626.12	61
62	2,549.553	23,409.1	1,434.845	15,105.32	62
63	2,342.870	20,859.5	1,349.567	13,670.48	63
64	2,146.872	18,516.6	1,265.135	12,320.91	64
65	1,961.167	16,369.7	1,181.661	11,055.78	65
66	1,785.442	14,408.5	1,099.326	9,874.116	66
67	1,619.458	12,623.1	1,018.363	8,774.789	67
68	1,462.950	11,003.6	938.9722	7,756.426	68
69	1,315.778	9,540.60	861.4638	6,817.454	69
70	1,177.825	8,224.82	786.1674	5,955.990	70
71	1,048.900	7,047.00	713.3297	5,169.823	71
72	928.8680	5,998.10	643.2450	4,456.493	72
73	817.5768	5,069.23	576.1854	3,813.248	73
74	714.8863	4,251.65	512.4272	3,237.063	74
75	620.6113	3,536.76	452.1944	2,724.636	75

## Actuaries' or Combined Experience—6 per Cent.

AGES.	D.	N.	M.	R.	AGES.
15	40,322.82	610,834.6	5,747.282	125,735.3	15
16	37,776.27	570,511.8	5,483.145	119,988.0	16
17	35,388.43	532,735.5	5,233.588	114,504.8	17
18	33,149.53	497,347.1	4,997.807	109,271.2	18
19	31,050.05	464,197.6	4,774.711	104,273.4	19
20	29,081.41	433,147.5	4,563.619	99,498.73	20
21	27,235.26	404,066.1	4,363.593	94,935.11	21
22	25,504.10	376,830.9	4,174.057	90,571.52	22
23	23,800.89	351,326.8	3,994.464	86,397.46	23
24	22,358.72	327,445.9	3,824.049	82,403.00	24
25	20,931.43	305,087.2	3,662.348	78,578.95	25
26	19,593.21	284,155.7	3,508.921	74,916.60	26
27	18,338.37	264,562.5	3,363.141	71,407.68	27
28	17,161.85	246,224.1	3,224.635	68,044.54	28
29	16,058.65	229,062.3	3,092.861	64,819.90	29
30	15,024.31	213,003.6	2,967.502	61,727.04	30
31	14,054.47	197,979.3	2,848.089	58,759.54	31
32	13,145.19	183,924.9	2,734.350	55,911.45	32
33	12,292.65	170,779.7	2,625.880	53,177.10	33
34	11,493.41	158,487.0	2,522.446	50,551.22	34
35	10,744.22	146,993.6	2,423.826	48,028.77	35
36	10,041.91	136,249.4	2,329.684	45,604.95	36
37	9,383.648	126,207.5	2,239.829	43,275.26	37
38	8,766.746	116,823.8	2,154.076	41,035.43	38
39	8,188.555	108,057.1	2,072.147	38,881.36	39
40	7,646.818	99,868.50	1,993.883	36,809.21	40
41	7,139.228	92,221.68	1,919.132	34,815.33	41
42	6,663.649	85,082.45	1,847.661	32,896.20	42
43	6,217.974	78,418.80	1,779.173	31,048.54	43
44	5,800.015	72,200.83	1,713.176	29,269.36	44
45	5,407.709	66,400.81	1,649.172	27,556.19	45
46	5,039.310	60,993.10	1,586.871	25,907.01	46
47	4,693.028	55,953.79	1,525.833	24,320.14	47
48	4,367.547	51,260.76	1,465.994	22,794.31	48
49	4,061.573	46,893.22	1,407.240	21,328.32	49
50	3,773.964	42,831.64	1,349.531	19,921.08	50
51	3,503.597	39,057.68	1,292.785	18,571.54	51
52	3,249.426	35,554.08	1,236.931	17,278.76	52
53	3,010.479	32,304.66	1,181.914	16,041.83	53
54	2,785.851	29,294.18	1,127.689	14,859.92	54
55	2,574.774	26,508.33	1,074.302	13,732.23	55
56	2,376.409	23,933.55	1,021.680	12,657.92	56
57	2,190.049	21,557.14	969.8330	11,636.24	57
58	2,015.094	19,367.10	918.8434	10,666.41	58
59	1,850.872	17,352.00	868.6835	9,747.568	59
60	1,696.784	15,501.13	819.3620	8,878.884	60
61	1,552.180	13,804.35	770.8019	8,059.522	61
62	1,416.567	12,252.17	723.0479	7,288.720	62
63	1,289.449	10,835.60	676.1135	6,565.672	63
64	1,170.431	9,546.149	630.0829	5,889.559	64
65	1,059.101	8,375.718	585.0041	5,259.476	65
66	955.1078	7,316.617	540.9597	4,674.472	66
67	858.1429	6,361.509	498.0576	4,133.512	67
68	767.8970	5,503.366	456.3857	3,635.454	68
69	684.1310	4,735.469	416.0857	3,179.069	69
70	606.6260	4,051.338	377.3051	2,762.983	70
71	535.1284	3,444.712	340.1447	2,385.678	71
72	469.4196	2,909.584	304.7262	2,045.533	72
73	409.2786	2,440.164	271.1562	1,740.807	73
74	354.4957	2,030.886	239.5399	1,469.651	74
75	304.8436	1,676.390	209.9537	1,230.111	75

## An Accumulation Formula for Reserves,

With Substitutes for the **Actuaries'** Table at 4, 5 and 6 per cent.

$$H_{x+1}^{n+1} = u_{x+n} \times (H_x^n + \varphi_x) - k_{x+n}.$$

AGES.	$u_x$			$k_x$	AGES.
	4 per cent.	5 per cent.	6 per cent.		
15	1.04727	1.05734	1.06741	.006 992	15
16	1.04733	1.05740	1.06748	.007 052	16
17	1.04740	1.05747	1.06754	.007 113	17
18	1.04747	1.05755	1.06762	.007 185	18
19	1.04755	1.05762	1.06770	.007 259	19
20	1.04764	1.05771	1.06779	.007 344	20
21	1.04773	1.05780	1.06788	.007 432	21
22	1.04782	1.05790	1.06797	.007 520	22
23	1.04793	1.05800	1.06808	.007 622	23
24	1.04803	1.05811	1.06819	.007 725	24
25	1.04814	1.05822	1.06830	.007 830	25
26	1.04827	1.05835	1.06843	.007 949	26
27	1.04839	1.05847	1.06856	.008 071	27
28	1.04854	1.05862	1.06870	.008 206	28
29	1.04868	1.05876	1.06885	.008 344	29
30	1.04884	1.05892	1.06901	.008 497	30
31	1.04900	1.05909	1.06917	.008 652	31
32	1.04918	1.05927	1.06935	.008 824	32
33	1.04936	1.05945	1.06954	.008 999	33
34	1.04955	1.05964	1.06973	.009 179	34
35	1.04975	1.05984	1.06994	.009 375	35
36	1.04996	1.06005	1.07015	.009 576	36
37	1.05018	1.06027	1.07037	.009 782	37
38	1.05040	1.06051	1.07061	.010 005	38
39	1.05064	1.06075	1.07085	.010 235	39
40	1.05089	1.06099	1.07110	.010 470	40
41	1.05116	1.06126	1.07137	.010 726	41
42	1.05146	1.06157	1.07168	.011 014	42
43	1.05183	1.06195	1.07206	.011 379	43
44	1.05231	1.06243	1.07255	.011 836	44
45	1.05286	1.06298	1.07311	.012 363	45
46	1.05353	1.06366	1.07379	.013 006	46
47	1.05425	1.06439	1.07452	.013 701	47
48	1.05504	1.06519	1.07533	.014 466	48
49	1.05590	1.06606	1.07621	.015 291	49
50	1.05684	1.06701	1.07717	.016 197	50
51	1.05788	1.06805	1.07822	.017 189	51
52	1.05901	1.06919	1.07937	.018 275	52
53	1.06024	1.07044	1.08063	.019 464	53
54	1.06156	1.07177	1.08198	.020 735	54
55	1.06303	1.07325	1.08347	.022 144	55
56	1.06462	1.07486	1.08509	.023 674	56
57	1.06632	1.07657	1.08682	.025 304	57
58	1.06819	1.07846	1.08873	.027 101	58
59	1.07023	1.08052	1.09081	.029 068	59
60	1.07254	1.08285	1.09316	.031 285	60
61	1.07506	1.08540	1.09573	.033 711	61
62	1.07786	1.08822	1.09858	.036 399	62
63	1.08090	1.09130	1.10169	.039 328	63
64	1.08427	1.09469	1.10512	.042 563	64
65	1.08796	1.09842	1.10888	.046 115	65
66	1.09199	1.10249	1.11300	.049 994	66
67	1.09644	1.10698	1.11752	.054 268	67
68	1.10126	1.11185	1.12244	.058 907	68
69	1.10648	1.11713	1.12776	.063 928	69
70	1.11222	1.12291	1.13361	.069 442	70
71	1.11847	1.12922	1.13998	.075 452	71
72	1.12530	1.13612	1.14694	.082 022	72
73	1.13275	1.14365	1.15454	.089 186	73
74	1.14083	1.15191	1.16288	.097 054	74
75	1.14988	1.16094	1.17200	.105 657	75

# An Accumulation Formula for Reserves,

With Substitutes for the **American** Table at 4,  $4\frac{1}{2}$  and 5 per cent.

$$H_{x+n}^n = u_{x+n} \times (H_x + \varphi_x) - k_{x+n}.$$

AGES.	$u_x$			$k_x$	AGES.
	4 per cent.	$4\frac{1}{2}$ per cent.	5 per cent.		
15	1.04800	1.05304	1.05808	.007 692	15
16	1.04803	1.05307	1.05811	.007 720	16
17	1.04806	1.05310	1.05814	.007 748	17
18	1.04810	1.05314	1.05818	.007 786	18
19	1.04814	1.05318	1.05822	.007 826	19
20	1.04818	1.05322	1.05826	.007 866	20
21	1.04824	1.05328	1.05832	.007 917	21
22	1.04828	1.05333	1.05837	.007 969	22
23	1.04834	1.05338	1.05842	.008 022	23
24	1.04840	1.05344	1.05848	.008 075	24
25	1.04846	1.05350	1.05854	.008 130	25
26	1.04852	1.05357	1.05861	.008 196	26
27	1.04860	1.05364	1.05868	.008 264	27
28	1.04867	1.05371	1.05875	.008 333	28
29	1.04875	1.05380	1.05884	.008 415	29
30	1.04884	1.05388	1.05892	.008 498	30
31	1.04893	1.05397	1.05901	.008 583	31
32	1.04903	1.05407	1.05912	.008 681	32
33	1.04915	1.05419	1.05923	.008 794	33
34	1.04927	1.05431	1.05936	.008 909	34
35	1.04939	1.05443	1.05948	.009 027	35
36	1.04954	1.05458	1.05963	.009 172	36
37	1.04970	1.05474	1.05979	.009 320	37
38	1.04988	1.05493	1.05997	.009 497	38
39	1.05007	1.05512	1.06016	.009 679	39
40	1.05029	1.05534	1.06039	.009 891	40
41	1.05051	1.05556	1.06061	.010 109	41
42	1.05077	1.05583	1.06088	.010 359	42
43	1.05105	1.05611	1.06116	.010 629	43
44	1.05138	1.05644	1.06149	.010 947	44
45	1.05174	1.05680	1.06185	.011 289	45
46	1.05216	1.05722	1.06228	.011 697	46
47	1.05263	1.05769	1.06275	.012 146	47
48	1.05317	1.05824	1.06330	.012 668	48
49	1.05381	1.05888	1.06395	.013 280	49
50	1.05453	1.05960	1.06467	.013 974	50
51	1.05535	1.06042	1.06550	.014 755	51
52	1.05625	1.06133	1.06641	.015 629	52
53	1.05727	1.06235	1.06743	.016 604	53
54	1.05841	1.06350	1.06859	.017 704	54
55	1.05968	1.06478	1.06987	.018 922	55
56	1.06110	1.06620	1.07130	.020 289	56
57	1.06267	1.06778	1.07289	.021 800	57
58	1.06441	1.06953	1.07465	.023 474	58
59	1.06636	1.07149	1.07661	.025 347	59
60	1.06852	1.07366	1.07880	.027 425	60
61	1.07093	1.07608	1.08123	.029 739	61
62	1.07360	1.07876	1.08392	.032 302	62
63	1.07654	1.08172	1.08689	.035 136	63
64	1.07982	1.08501	1.09020	.038 285	64
65	1.08348	1.08869	1.09390	.041 807	65
66	1.08753	1.09276	1.09799	.045 704	66
67	1.09203	1.09728	1.10253	.050 031	67
68	1.09705	1.10232	1.10760	.054 855	68
69	1.10258	1.10789	1.11319	.060 178	69
70	1.10873	1.11406	1.11940	.066 090	70
71	1.11548	1.12084	1.12621	.072 576	71
72	1.12279	1.12818	1.13358	.079 602	72
73	1.13065	1.13609	1.14153	.087 167	73
74	1.13914	1.14461	1.15009	.095 323	74
75	1.14837	1.15389	1.15941	.104 204	75

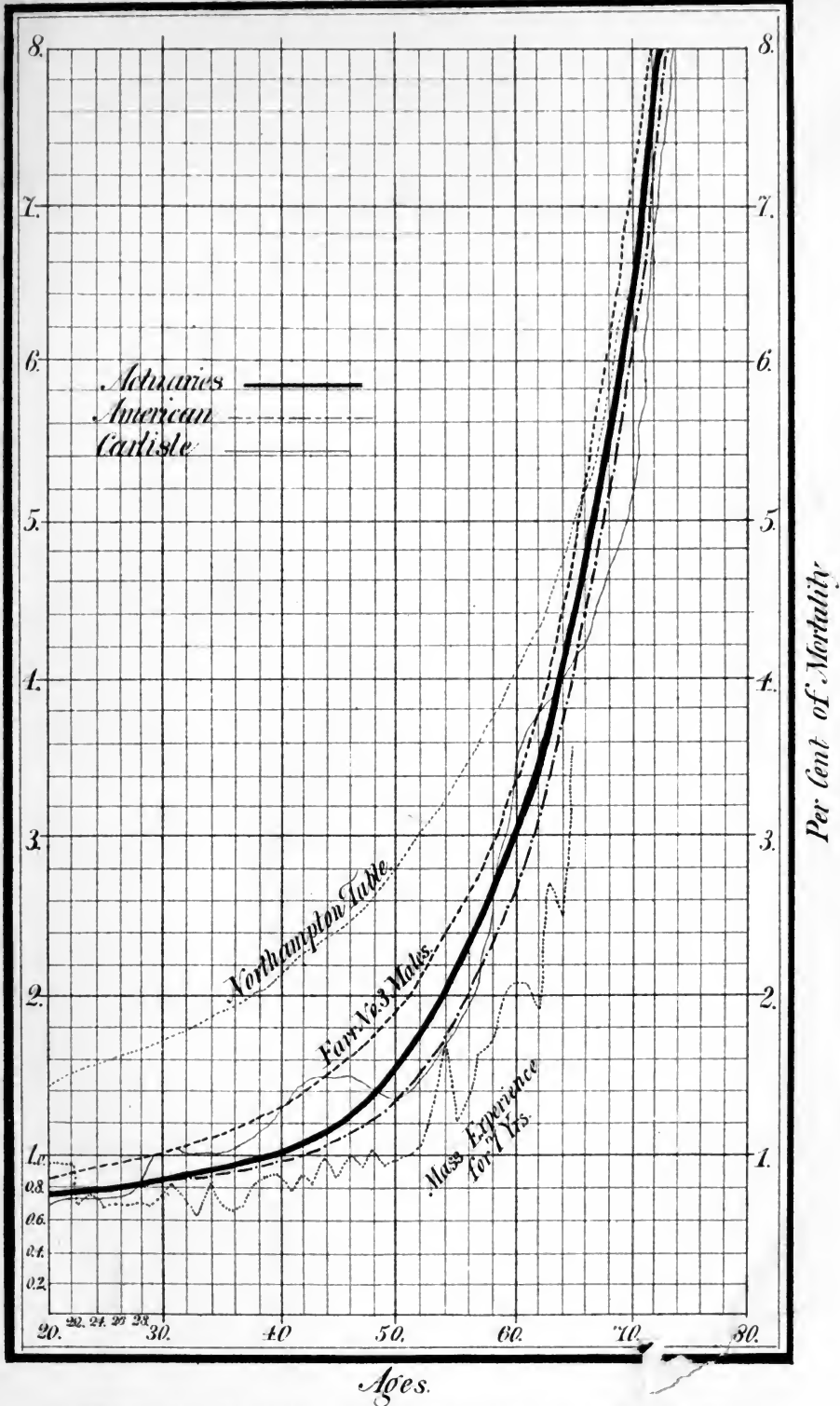


Diagram of the RATES OF MORTALITY by various Tables.

Ages shown at the bottom and per cent. of Mortality on the sides.



6.

=





ESTABLISHED 1853.

THE OLDEST INSURANCE PUBLICATION IN THE UNITED STATES

AND THE

**Largest in the World.**

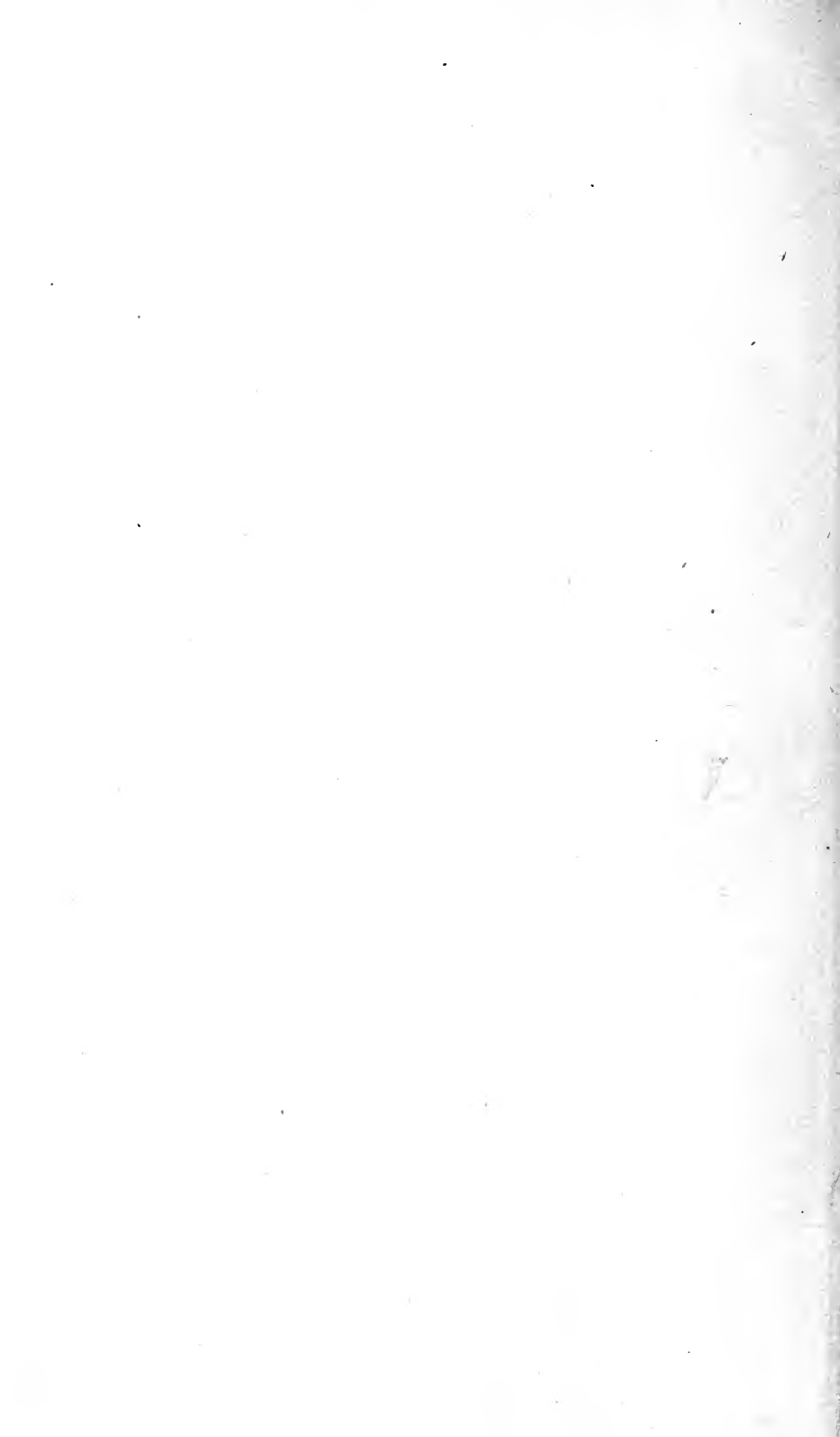
# THE INSURANCE MONITOR

Has for Seventeen Years been the Recognized Leader in Insurance Journalism.

Subscriptions, per Annum, \$3, in advance. Advertisements, \$60 per Square.

C. C. HINE, Editor and Proprietor,

176 Broadway, New York







PLEASE DO NOT REMOVE  
CARDS OR SLIPS FROM THIS POCKET

---

UNIVERSITY OF TORONTO LIBRARY

---

HG  
8853  
F23  
1370

Fackler, David Parks  
Agents' monetary, life &  
valuation tables.

